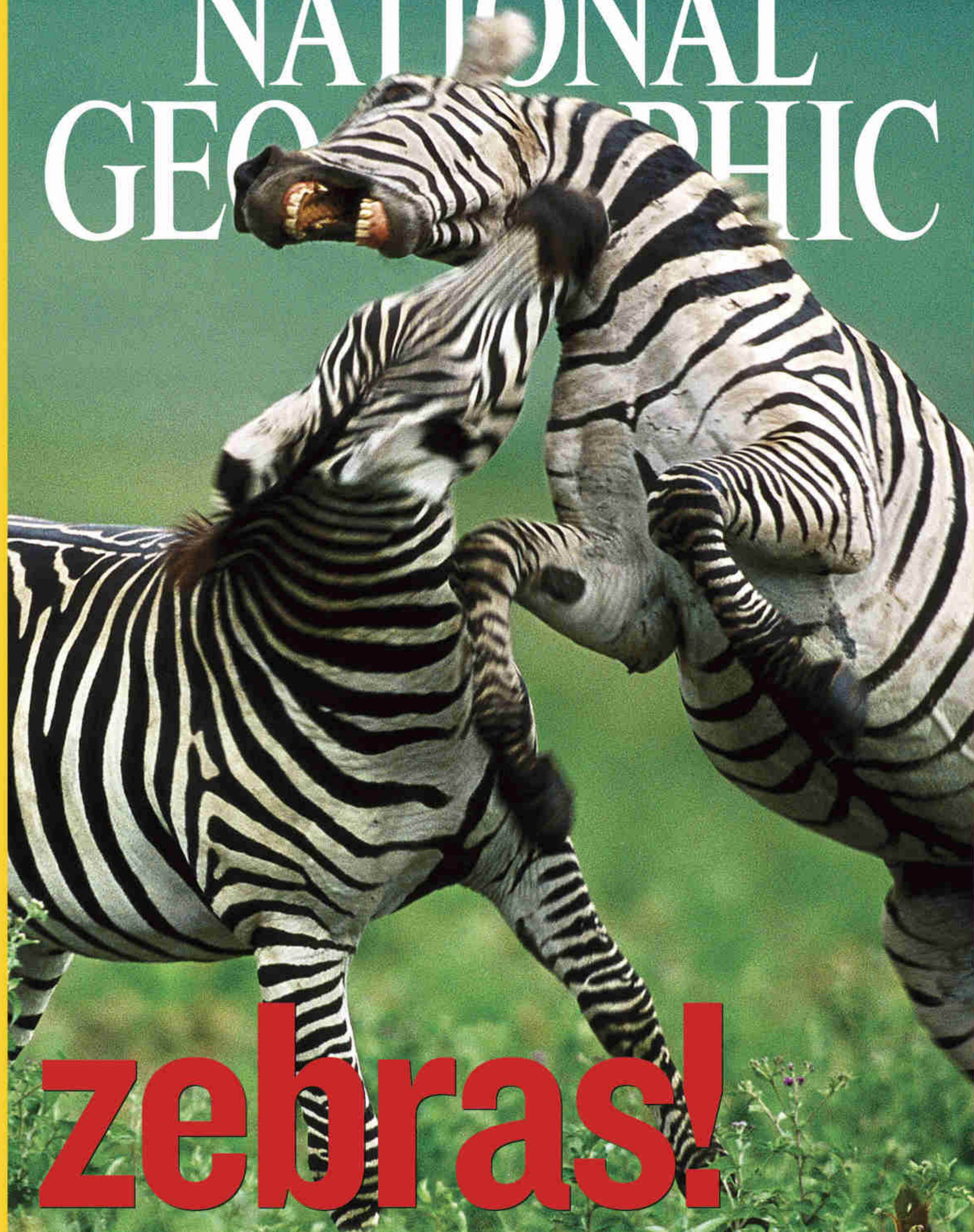


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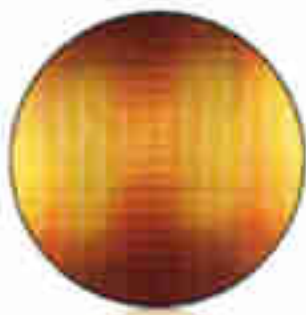


zebras!

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The world's fastest personal computer.

The new Power Mac® G5 is here. It's the world's fastest* personal computer, and the first with a 64-bit processor. At its heart are two revolutionary PowerPC G5 processors,



*The PowerPC G5 chip.
The world's first 64-bit
processor for personal
computers.*

running at speeds up to 2GHz. And since these are 64-bit processors, they can access up to 8GB of memory in the Power Mac G5, which is double the

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In side-by-side speed tests using industry-standard benchmarks, the dual 2.0-gigahertz Power Mac G5 is up to 41% faster than both the fastest Pentium 4 and dual-processor Xeon workstation. And the results get even better when using real-world applications:

SPECint_rate 2000: Integer calculations

Dual 2GHz PowerPC G5	16.9
Dual 3.06GHz Xeon	16.7
3GHz Pentium 4	10.3

SPECfp_rate 2000: Floating-point calculations

Dual 2GHz PowerPC G5	15.8
Dual 3.06GHz Xeon	11.1
3GHz Pentium 4	8.1

Independent tests show the Power Mac G5 edges out the competition on integer and blasts past them in floating-point.

the new Power Mac G5 runs Photoshop more than twice as fast as the fastest PCs. Further tests reveal there are similar gains across a wide range of applications, from music and video to science and mathematics.



*The PowerPC G5 chip is based
on IBM's highest performance
64-bit supercomputer processors.*

Impressed? We haven't even touched on

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Winner gets the fillies: Zebra stallions spar over mating rights in Tanzania's Ngorongoro Conservation Area.

BY ANUP AND MANOJ SHAH

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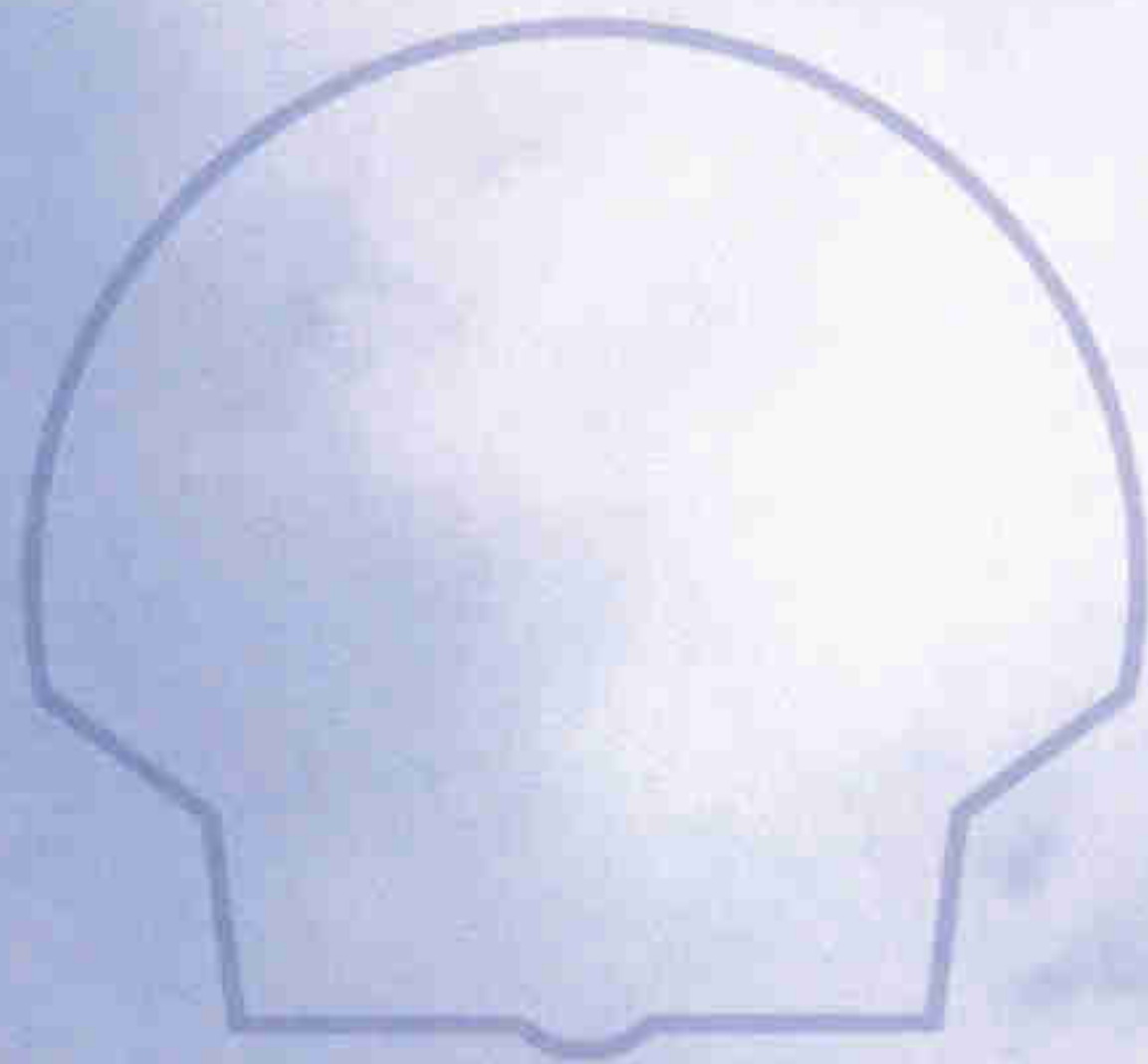
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Michael Fay sets off on a 2,000-mile jungle trek. ■ **WEDNESDAY: ULTIMATE ENEMIES** Dereck and Beverly Joubert document elephants and lions fighting for survival in Africa.

■ **THURSDAY: SEA HUNTERS** Explorers search for the *Andrea Gail*, sunk in *The Perfect Storm*. ■ **FRIDAY: SNAKE HUNTER** Herpetologist Rom Whitaker witnesses rarely seen snake behavior across North America. ■ **SATURDAY: SUPERCROC** Paleontologist Paul Sereno and herpetologist Brady Barr embark on a global quest to understand a gigantic prehistoric croc.



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NGS PHOTOGRAPHER JODI COBB

Panneer is ten years old. He winds thread 14 hours a day for looms in Kanchipuram, India. His fingers bleed. His body is being poisoned by dye.

Thousands of child slaves work India's silk industry. Photographer Jodi Cobb and her assistant Neha Diddee saw the life they endure on the day they met Panneer. Later, after hours of shooting, Jodi and Neha walked back to their car, sat down, and wept.

The "21st-Century Slaves" article in this issue may have the same effect on you as it had on Jodi, author Andrew Cockburn, and the rest of the team that prepared the story. You may cry. You may be sickened. You may be riveted, unable to stop reading. Or you may decide you can't bear any more, and flip to the next article.

As an editor, why would I decide to publish an article that makes people want to turn away, or that they may not want their children to see? Because until we began work on this story I had no idea there were 27 million slaves in the world—all around us, largely invisible. I think you should know, and I think your children should know. Here's my promise: If you read the story that begins on page 2, you'll never look at the world the same way again.

Bill Allen

■ Watch my preview of the October issue on **National Geographic Today** on September 16 at 7 p.m. and again at 10 p.m. ET/PT on the National Geographic Channel.

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Nexium® (esomeprazole magnesium) 20-MG, 40-MG Delayed-Release Capsules

BRIEF SUMMARY Before prescribing NEXIUM, please see full Prescribing Information.

INDICATIONS AND USAGE NEXIUM is indicated for the short-term treatment (4 to 8 weeks) in the healing and symptomatic resolution of diagnostically confirmed erosive esophagitis. **CONTRAINDICATIONS** NEXIUM is contraindicated in patients with known hypersensitivity to any component of the formulation or to substituted benzimidazoles.

PRECAUTIONS Symptomatic response to therapy with NEXIUM does not preclude the presence of gastric malignancy. Atrophic gastritis has been noted occasionally in gastric corpus biopsies from patients treated long-term with omeprazole, of which NEXIUM is an enantiomer.

Information for Patients: NEXIUM Delayed-Release Capsules should be taken at least one hour before meals. For patients who have difficulty swallowing capsules, one tablespoon of applesauce can be added to an empty bowl and the NEXIUM Delayed-Release Capsule opened, and the pellets carefully emptied onto the applesauce. The pellets should be mixed with the applesauce and then swallowed immediately. The applesauce used should not be hot and should be soft enough to be swallowed without chewing. The pellets should not be chewed or crushed. The pellet/applesauce mixture should not be stored for future use. Antacids may be used while taking NEXIUM. **Drug Interactions:** Esomeprazole is extensively metabolized in the liver by CYP2C19 and CYP3A4. *In vitro* and *in vivo* studies have shown that esomeprazole is not likely to inhibit CYPs 1A2, 2A6, 2C9, 2D6, 2E1 and 3A4. No clinically relevant interactions with drugs metabolized by these CYP enzymes would be expected. Drug interaction studies have shown that esomeprazole does not have any clinically significant interactions with phenytoin, warfarin, quinidine, clarithromycin or amoxicillin. Post-marketing reports of changes in prothrombin measures have been received among patients on concomitant warfarin and esomeprazole therapy. Increases in INR and prothrombin time may lead to abnormal bleeding and even death. Patients treated with proton pump inhibitors and warfarin concomitantly may need to be monitored for increases in INR and prothrombin time. Esomeprazole may potentially interfere with CYP2C19, the major esomeprazole metabolizing enzyme. Coadministration of esomeprazole 30 mg and diazepam, a CYP2C19 substrate, resulted in a 45% decrease in clearance of diazepam. Increased plasma levels of diazepam were observed 12 hours after dosing and onwards. However, at that time, the plasma levels of diazepam were below the therapeutic interval, and thus this interaction is unlikely to be of clinical relevance. Esomeprazole inhibits gastric acid secretion. Therefore, esomeprazole may interfere with the absorption of drugs where gastric pH is an important determinant of bioavailability (eg, ketoconazole, iron salts and digoxin). Coadministration of oral contraceptives, diazepam, phenytoin, or quinidine did not seem to change the pharmacokinetic profile of esomeprazole. **Carcinogenesis, Mutagenesis, Impairment of Fertility:** The carcinogenic potential of esomeprazole was assessed using omeprazole studies. In two 24-month oral carcinogenicity studies in rats, omeprazole at daily doses of 1.7, 3.4, 13.8, 44.0 and 140.8 mg/kg/day (about 0.7 to 57 times the human dose of 20 mg/day expressed on a body surface area basis) produced gastric ECL cell carcinoids in a dose-related manner in both male and female rats; the incidence of this effect was markedly higher in female rats, which had higher blood levels of omeprazole. Gastric carcinoids seldom occur in the untreated rat. In addition, ECL cell hyperplasia was present in all treated groups of both sexes. In one of these studies, female rats were treated with 13.8 mg omeprazole/kg/day (about 5.6 times the human dose on a body surface area basis) for 1 year, then followed for an additional year without the drug. No carcinoids were seen in these rats. An increased incidence of treatment-related ECL cell hyperplasia was observed at the end of 1 year (94% treated vs 10% controls). By the second year the difference between treated and control rats was much smaller (46% vs 26%) but still showed more hyperplasia in the treated group. Gastric adenocarcinoma was seen in one rat (2%). No similar tumor was seen in male or female rats treated for 2 years. For this strain of rat no similar tumor has been noted historically, but a finding involving only one tumor is difficult to interpret. A 78-week mouse carcinogenicity study of omeprazole did not show increased tumor occurrence, but the study was not conclusive. Esomeprazole was negative in the Ames mutation test, in the *in vivo* rat bone marrow cell chromosome aberration test, and the *in vivo* mouse micronucleus test. Esomeprazole, however, was positive in the *in vitro* human lymphocyte chromosome aberration test. Omeprazole was positive in the *in vitro* human lymphocyte chromosome aberration test, the *in vivo* mouse bone marrow cell chromosome aberration test, and the *in vivo* mouse micronucleus test. The potential effects of esomeprazole on fertility and reproductive performance were assessed using omeprazole studies. Omeprazole at oral doses up to 138 mg/kg/day in rats (about 56 times the human dose on a body surface area basis) was found to have no effect on reproductive performance of parental animals. **Pregnancy: Teratogenic Effects. Pregnancy Category B—**Teratology studies have been performed in rats at oral doses up to 280 mg/kg/day (about 57 times the human dose on a body surface area basis) and in rabbits at oral doses up to 86 mg/kg/day (about 35 times the human dose on a body surface area basis) and have revealed no evidence of impaired fertility or harm to the fetus due to esomeprazole. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed. Teratology studies conducted with omeprazole in rats at oral doses up to 138 mg/kg/day (about 56 times the human dose on a body surface area basis) and in rabbits at doses up to 69 mg/kg/day (about 56 times the human dose on a body surface area basis) did not disclose any evidence for a teratogenic potential of omeprazole. In rabbits, omeprazole in a dose range of 6.9 to 69.1 mg/kg/day (about 5.5 to 56 times the human dose on a body surface area basis) produced dose-related increases in embryo-lethality, fetal resorptions, and pregnancy disruptions. In rats, dose-related embryo/fetal toxicity and postnatal developmental toxicity were observed in offspring resulting from parents treated with omeprazole at 13.8 to 138.0 mg/kg/day

(about 5.6 to 56 times the human doses on a body surface area basis). There are no adequate and well-controlled studies in pregnant women. Sporadic reports have been received of congenital abnormalities occurring in infants born to women who have received omeprazole during pregnancy. **Nursing Mothers:** The excretion of esomeprazole in milk has not been studied. However, omeprazole concentrations have been measured in breast milk of a woman following oral administration of 20 mg. Because esomeprazole is likely to be excreted in human milk, because of the potential for serious adverse reactions in nursing infants from esomeprazole, and because of the potential for tumorigenicity shown for omeprazole in rat carcinogenicity studies, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother. **Pediatric Use:** Safety and effectiveness in pediatric patients have not been established. **Geriatric Use:** Of the total number of patients who received NEXIUM in clinical trials, 778 were 65 to 74 years of age and 124 patients were ≥ 75 years of age. No overall differences in safety and efficacy were observed between the elderly and younger individuals, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. **ADVERSE REACTIONS** The safety of NEXIUM was evaluated in over 10,000 patients (aged 18-84 years) in clinical trials worldwide including over 7,400 patients in the United States and over 2,600 patients in Europe and Canada. Over 2,900 patients were treated in long-term studies for up to 6-12 months. In general, NEXIUM was well tolerated in both short- and long-term clinical trials. The safety in the treatment of healing of erosive esophagitis was assessed in four randomized comparative clinical trials, which included 1,240 patients on NEXIUM 20 mg, 2,434 patients on NEXIUM 40 mg, and 3,008 patients on omeprazole 20 mg daily. The most frequently occurring adverse events ($\geq 1\%$) in all three groups was headache (5.5, 5.0, and 3.8, respectively) and diarrhea (no difference among the three groups). Nausea, flatulence, abdominal pain, constipation, and dry mouth occurred at similar rates among patients taking NEXIUM or omeprazole. Additional adverse events that were reported as possibly or probably related to NEXIUM with an incidence $< 1\%$ are listed below by body system: **Body as a Whole:** abdomen enlarged, allergic reaction, asthenia, back pain, chest pain, chest pain substernal, facial edema, peripheral edema, hot flushes, fatigue, fever, flu-like disorder, generalized edema, leg edema, malaise, pain, rigors; **Cardiovascular:** flushing, hypertension, tachycardia; **Endocrine:** goiter; **Gastrointestinal:** bowel irregularity, constipation aggravated, dyspepsia, dysphagia, dysplasia GI, epigastric pain, eructation, esophageal disorder, frequent stools, gastroenteritis, GI hemorrhage, GI symptoms not otherwise specified, hiccup, melena, mouth disorder, pharynx disorder, rectal disorder, serum gastrin increased, tongue disorder, tongue edema, ulcerative stomatitis, vomiting; **Hearing:** earache, tinnitus; **Hematologic:** anemia, anemia hypochromic, cervical lymphadenopathy, epistaxis, leukocytosis, leukopenia, thrombocytopenia; **Hepatic:** bilirubinemia, hepatic function abnormal, SGOT increased, SGPT increased; **Metabolic/Nutritional:** glycosuria, hyperuricemia, hyponatremia, increased alkaline phosphatase, thirst, vitamin B12 deficiency, weight increase, weight decrease; **Musculoskeletal:** arthralgia, arthritis aggravated, arthropathy, cramps, fibromyalgia syndrome, hernia, polymyalgia rheumatica; **Nervous System/Psychiatric:** anorexia, apathy, appetite increased, confusion, depression aggravated, dizziness, hypertonia, nervousness, hypoesthesia, impotence, insomnia, migraine, migraine aggravated, paresthesia, sleep disorder, somnolence, tremor, vertigo, visual field defect; **Reproductive:** dysmenorrhea, menstrual disorder, vaginitis; **Respiratory:** asthma aggravated, coughing, dyspnea, larynx edema, pharyngitis, rhinitis, sinusitis; **Skin and Appendages:** acne, angioedema, dermatitis, pruritus, pruritus ani, rash, rash erythematous, rash maculo-papular, skin inflammation, sweating increased, urticaria; **Special Senses:** otitis media, parosmia, taste loss, taste perversion; **Urogenital:** abnormal urine, albuminuria, cystitis, dysuria, fungal infection, hematuria, micturition frequency, moniliasis, genital moniliasis, polyuria; **Visual:** conjunctivitis, vision abnormal. Endoscopic findings that were reported as adverse events include: duodenitis, esophagitis, esophageal stricture, esophageal ulceration, esophageal varices, gastric ulcer, gastritis, hernia, benign polyps or nodules, Barrett's esophagus, and mucosal discoloration. **Postmarketing Reports—**There have been spontaneous reports of adverse events with postmarketing use of esomeprazole. These reports have included rare cases of anaphylactic reaction. Other adverse events not observed with NEXIUM, but occurring with omeprazole can be found in the omeprazole package insert, **ADVERSE REACTIONS** section. **OVERDOSAGE** A single oral dose of esomeprazole at 510 mg/kg (about 103 times the human dose on a body surface area basis), was lethal to rats. The major signs of acute toxicity were reduced motor activity, changes in respiratory frequency, tremor, ataxia, and intermittent clonic convulsions. There have been some reports of overdose with esomeprazole. Reports have been received of overdose with omeprazole in humans. Doses ranged up to 2,400 mg (120 times the usual recommended clinical dose). Manifestations were variable, but included confusion, drowsiness, blurred vision, tachycardia, nausea, diaphoresis, flushing, headache, dry mouth, and other adverse reactions similar to those seen in normal clinical experience (see omeprazole package insert-**ADVERSE REACTIONS**). No specific antidote for esomeprazole is known. Since esomeprazole is extensively protein bound, it is not expected to be removed by dialysis. In the event of overdose, treatment should be symptomatic and supportive. As with the management of any overdose, the possibility of multiple drug ingestion should be considered. For current information on treatment of any drug overdose, a certified Regional Poison Control Center should be contacted. Telephone numbers are listed in the Physicians' Desk Reference (PDR) or local telephone book.

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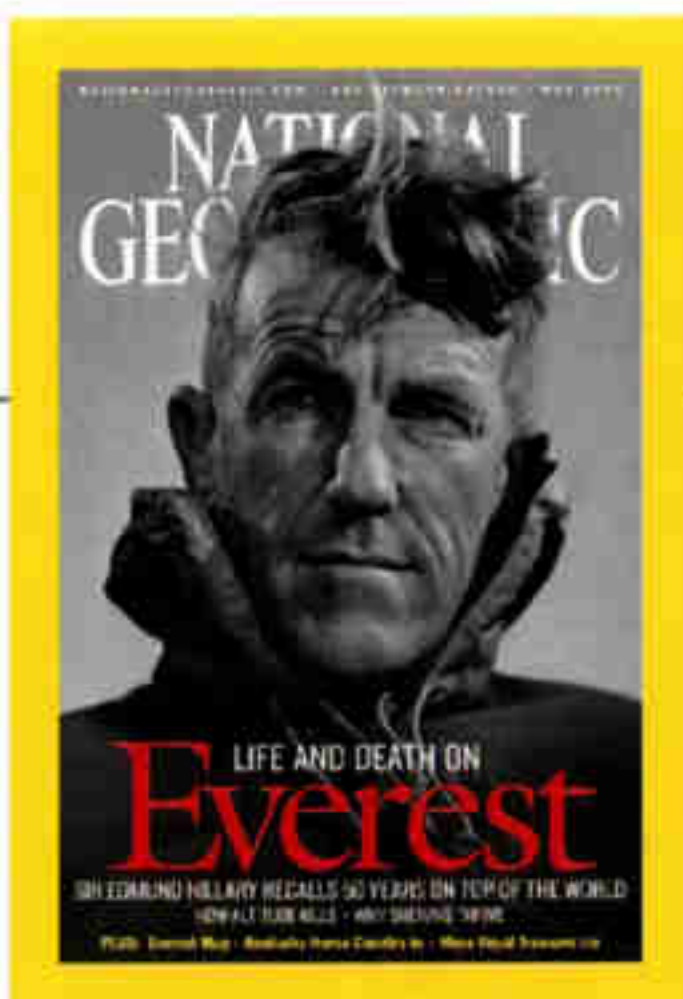
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Forum

May 2003

The stories honoring the first human footsteps on Everest's summit inspired a big pile of mail. There was praise for Edmund Hillary (right)—and protestations about the omission of readers' favorite expeditions, from the first winter summit, by Leszek Cichy and Krzysztof Wielicki of Poland in 1980, to Göran Kropp's 1996 ascent after biking from Sweden (with only one pair of underwear).



Mount Everest

As unconquered goals such as Everest have largely disappeared, one cannot help but feel somewhat sad. What natural pinnales and regions do our youth have left to explore for themselves? The great days of exploration may have passed, but Sir Edmund Hillary shows us that still greater exploration and success can be achieved by extending human kindness to others.

GEOFF PROVEN
Portencross, Scotland

Sir Edmund Hillary is a hero not because he was the first to climb the mountain but because he never forgot the Sherpas who helped him achieve this impossible feat. He dedicated his life to helping build schools and hospitals for them. His legacy will never be forgotten.

PATRE S. RAJASHEKHAR
Bangalore, India

I was distressed by the way you gave short shrift to Tenzing Norgay. Anyone reading your features could be forgiven for thinking that Hillary was the hero, and the other bloke helped him along. When I met Tenzing more than 30 years ago, he was saddened that Hillary cornered the glory. Tenzing explained to me what every mountaineer knows: When two climbers on a rope work their way up difficult terrain, they take turns at leading because the leader on the rope does the hardest work. Neither could have gotten there without the other. Hillary and Tenzing were like two wheels of a bicycle: The front wheel got there first, but not because it was superior.

CHINTAMANI RAO
New Delhi, India

You mentioned that Pete Athans summited Everest seven times and Ed Viesturs five times. But you didn't bother to mention that Apa Sherpa climbed Everest twelve times, Ang Rita Sherpa climbed it ten times (without supplemental oxygen!), and Ang Dorjee Sherpa climbed it eight times. Shame on you. These are the real superstars of climbing.

KENNETH LEE
Hong Kong, China

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HELMUT LANG

Sherpas

I've heard that Sherpas and Indians of the Andes have different physiological adaptations for living at high altitude. Is that really so?

IGOR M. VILLA
Berne, Switzerland

FROM OUR ONLINE FORUM
nationalgeographic.com/ngm/0305

Most scientists agree that high-altitude populations differ in how they take in and process oxygen. Studies indicate that Sherpas breathe at a faster rate, while Andeans have higher counts of the oxygen-carrying molecule hemoglobin. Evidence also suggests that Andean populations have larger lung capacities, allowing them to take in more air, but this has not been proved for Sherpas. Although scientists agree that a combination of factors enables longtime

dwellers at high altitudes to perform better there than lowlanders, there is no consensus on which populations are best adapted for the high life.

Thank you for giving names and voices to the Sherpa people. It has greatly irritated me for a long time that Western adventurers scale peaks literally on the backs of these people while giving them scant credit. If the Sherpas get acknowledged at all, it is usually a passing reference that makes them sound like some species of sturdy, sure-footed, well-mannered pack animals. I grind my teeth whenever I read of some tourist (who paid tens of thousands of dollars to bag his



ROBB KENDRICK

peak) recounting his harrowing struggle against the mountain, the arduous climb along the guide ropes, the perilous crevasse crossings on aluminum ladder bridges—which were placed there previously by Sherpas to make the climb possible. Sorry, but my awe and respect are reserved for the Sherpa who made the same trek without guide ropes or histrionics—while carrying the ladder on his back.

SHARI PRANGE
Bonny Doon, California

When I saw the photos of Namche Bazaar with electric lights and cybercafés, I was so surprised. I stayed there in 1977, and it was candles for light. A hot shower was taken by having two Sherpa women pour hot water from an upstairs room into a hose that flowed out of the ceiling in a room below. I didn't have one shower in three weeks, but the view out the window to the terraces miles below was worth any shower at the Ritz.

MARTHA KIRCHHOFF
Bridgeport, Connecticut

WRITE TO FORUM

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Mayflies

I was amazed by the photos in the mayfly article. They are without a doubt the best photos I have seen in the magazine in a very long time. The photographer made a very mundane subject fascinating. And then I was astonished to see in On Assignment that he is so young. He's just a kid, for crying out loud.

WILLIS GLASSGOW
Florence, South Carolina

Here in Montreal we once had serious problems with mayflies along the Lachine Rapids of the St. Lawrence River. It was so bad that on many days we could not ride bicycles or paint outside. I attended a concert given by the Montreal Symphony Orchestra that was aborted halfway through because of mayflies. Then local governments

installed birdhouses at 200- to 300-foot intervals along a ten-mile section of the river. They were occupied by purple martins. Since the installation of the birdhouses, the mayflies have diminished greatly.

MAURICE LEDUC
Montreal, Quebec

Kentucky Horse Country

I found the article on Kentucky horses sadly lacking. Though the focus was on mare reproductive loss syndrome, there is another grim reality in the horse racing business. For every entry in the Kentucky Derby, thousands of horses are struggling on cut-rate tracks trying to earn enough money to stay alive. When these horses begin to fail, they are sent on to lesser tracks until they simply can't run anymore. When that happens, many are sent to

July 2003

ÜBER AUTO

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Fasstensietbeltz! p.31



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auction, where they become starving rescue cases, or are sent to Canadian or Texas slaughterhouses. Horse slaughter is an integral part of the business for the animals that don't earn their keep. To train an intelligent animal to give its all, extend itself physically, to trust and try for people, and then to throw that animal away and betray its trust when it's not good enough is sad.

KELLY UTTER
Cockeysville, Maryland

The author says that the University of Kentucky links mare reproductive loss syndrome with eastern tent caterpillars. Why then is it appearing only now when we have experienced tent caterpillars for years?

JAN WOODWARD
Fairmont, West Virginia

Researchers are fairly certain that an outbreak of MRLS occurred in Kentucky during 1980 and 1981, but the extent of the outbreak was much smaller than in 2001 and 2002, and the actual cause was never determined. Scientists are still working to understand the exact link between eastern tent caterpillars and MRLS. Some speculate that an organism or toxin closely associated with the caterpillars, and not the caterpillars themselves, actually induces the fetal losses.

Unfortunately your focus solely on the Thoroughbred industry provides an incomplete picture of the damage that mare reproductive loss syndrome has caused to the horse industry in Kentucky. The Standardbred industry, which produces horses for harness racing, has been affected even more severely than the Thoroughbred industry. Standardbred yearlings can sell for more than \$100,000, so the economic losses to Standardbred

Hillary and Tenzing were like two wheels of a bicycle: The front wheel got there first, but not because it was superior.

farms in Kentucky—some of the finest in the world—have been devastating. Many of the top Standardbred nurseries are adjacent to the Thoroughbred farms shown on your map, yet they are not listed or mentioned.

KEITH GISSER
Cleveland Heights, Ohio

ZipUSA: Detroit, Michigan

My husband used to sail as a marine engineer on the Great Lakes for the American Steamship Company. After our marriage in 1978, I was allowed to make short trips with him. It really helped to break up the two-month separations we had. On one trip the only way to disembark was on the Detroit River via the mailboat *J. W. Westcott II*. My luggage was tied together and lowered. Then I went over the side, climbing several feet down a vertical ladder strapped to the side of this mammoth vessel, and hopped onto the deck of the *Westcott*, all while both vessels churned along at six miles an hour.

JANELLE N. SEAVEY
Oakland, Maine

Geographica

The article about the first birthday of Timor-Leste (formerly East Timor) was not fair. A reader gets the impression that everything about Indonesia's presence in East Timor was bad. Indonesians helped build more schools and infrastructure in East Timor from 1975 to 1999 than the

Portuguese did in four centuries. The author also did not mention that a certain big country—the U.S.—tacitly supported what he described as Indonesia's "brutal occupation."

DWI ELMATI
Semarang, Indonesia

Timor-Leste did not receive its independence from Indonesia. East Timor was undergoing decolonization from Portugal when it was invaded by Indonesia in 1975. Ten separate UN resolutions denounced Indonesia's illegal occupation. More than 100,000 East Timorese were killed by Indonesian soldiers, and another 300,000 were forcibly removed to West Timor. Birthday celebrations in any language will remain somber until an international tribunal brings to justice all the Indonesian military responsible for one of the worst genocides of the 20th century.

MARK RHOMBERG
East Timor Action Network
Los Angeles, California

Canon Ad

The photo in the July 2003 issue for the "Wildlife as Canon Sees It" advertisement was not of the intended subject, the yellow-faced Amazon parrot. The ad mistakenly shows a photo of the jandaya parakeet (*Aratinga jandaya*). National Geographic Advertising is responsible for acquiring the photos for this unique campaign, so I sincerely apologize for this error.

STEPHEN P. GIANNETTI
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THE PEOPLE, PLACES, AND



APHICA

CREATURES OF OUR UNIVERSE

CONSERVATION

Fatal Attraction

Skyscrapers' lights, windows take a grim toll on birds

These 2,000 birds didn't survive their migration through downtown Toronto last fall: Tall buildings stopped them cold. At night artificial light draws the birds; during daylight birds see reflections such as trees in windows and fly into them.

One remedy: "Turn off the lights at night," says Michael Mesure, executive director of the Fatal Light Awareness Program (FLAP), which collected these

victims and counted nearly as many dead birds during the spring migration. More than a hundred skyscraper owners in the Toronto area have agreed to minimize their lights.

Still, Mesure says, "Fatal strikes during the day far exceed those at night." Nonreflective glass in tree-level windows would help, but FLAP has had little success in persuading building owners to take that step.

—John L. Eliot

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DRIVE & LOVE

EVOLUTION

Reinventing the Wing

There's a buzz about stick insects: Scientists now believe they've lost and regrown their wings several times during their 300-million-year history, shattering the long-held assumption that the insect wing evolved just once.

Camouflage artists that mimic twigs, walkingsticks are divided into two types: winged (top left)



ALISON S. WHITING, BRIGHAM YOUNG UNIVERSITY (BOTH)

and partly winged or wingless (top right). Michael F. Whiting, a biologist at Brigham Young University, analyzed DNA from 37 species and found that their flightless ancestors sprouted wings about 250 million years ago. "After that, walkingsticks lost their wings, then re-evolved them at least four times," Whiting says.

But the wings didn't re-evolve

from scratch. Genes that govern walkingstick wing development appear to be linked to genes for other—more crucial—body parts, perhaps legs. So the wing genes are never lost, even if they aren't physically expressed. The genes turn on or off, depending on whether conditions make it more advantageous to be winged or wingless. —John L. Eliot



THE BRITISH MUSEUM, HERITAGE IMAGES

NGS RESEARCH GRANT

Important Grave Found at Jamestown

If he hadn't quickly sickened and died like many of Jamestown, Virginia's, first settlers, Bartholomew Gosnold might be as prominent in U.S. history books as John Smith and Pocahontas. He was one of the driving visionaries behind this first

permanent English settlement in the New World. As the expedition's chief promoter and vice admiral, Gosnold (above, at center) was buried with ceremony: Every gun in the fort he helped design was fired to mark his passing in 1607, at 36. Now archaeologists believe they've discovered his grave.

Excavators found the skeleton of a European man in his mid to late 30s who died during the

early years of the settlement. That he was given a coffin shows he was a person of high rank—and a captain's leading staff was ceremoniously placed on it.

"I am convinced this is Gosnold," says William Kelso, who leads the Jamestown excavations ("Unsettling Discoveries at Jamestown," June 2002). Proof will require more time and a bit of luck. The bones yielded mitochondrial DNA, which is passed down only through women. Kelso's team is searching through 400 years of maiden names in Gosnold's native Suffolk, England, for living female descendants of his mother and sisters.

—Karen E. Lange

The Unsung Gosnold

Among the New World legacies of this English explorer:

He named Cape Cod after the abundant fish found nearby.

He named Martha's Vineyard after his five-year-old daughter.

He encouraged English settlement of New England by successfully trading with the Wampanoag Indians and bringing back sassafras, cedar, furs, and reports of fertile soil.

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THE GEOGRAPHY OF EVERYDAY LIFE

Europe's Baby Bust

France began awarding medals for childbearing to women of "good character" after World War I to restore its devastated population. Today again in need of more children, France has relaxed its medal rules: The mothers don't have to be married; they don't even have to be French.

But it will take more than medals to stop the sharp population decline in most of Europe. According to the UN, Europe's population will shrink by more than 90 million people in the next 50 years, roughly twice the number killed worldwide during World War II. For more than two decades the total fertility rate—the average number of children each woman will bear in her lifetime—has remained below the 2.1 level required to replace the population. Finally, five years ago, Europe's population began to fall. Now demographers are abandoning their assumption that the fertility rate will return to replacement level in the near future.



FERDINANDO SCIANNA. MAGNUM



"It's a monumental change," says Joseph Chamie, director of the United Nations Population Division.

And one that may not be limited to Europe. Many demographers predict that global fertility rates will follow Europe's lead and that the world's population could decline by the end of this century—a trend unseen since the 14th-century Black Death.

Among the first nations to experience the population implosion will be historically fertile Italy. With births below replacement level since 1977, Italy is projected to lose nearly a quarter of its current population by 2050.

What accounts for quieter nurseries in Italy (left) and the rest of Europe? Contraceptive use is at

record levels, and women are earning more college degrees than men, leading many to seek careers first and families second—if at all. Couples who do start families are waiting longer to have their first child.

Without babies to replenish the labor force and pay taxes, Europeans will be hard-pressed to fund the pensions of longer living retirees. To stay in the black, governments will need to take unpopular steps, such as raising the retirement age, cutting benefits, hiking taxes, and increasing legal immigration. Says Chamie: "There's no way out of the demographic box."

—Scott Elder

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PRESERVATION

For Sale: Room With a View

Fans of famous tower block housing plan

You likely don't know its name. But thanks to countless landscape photos—and even a few TV car ads—the stark 400-foot sandstone spire in the Utah desert near Moab is probably etched somewhere in your memory.

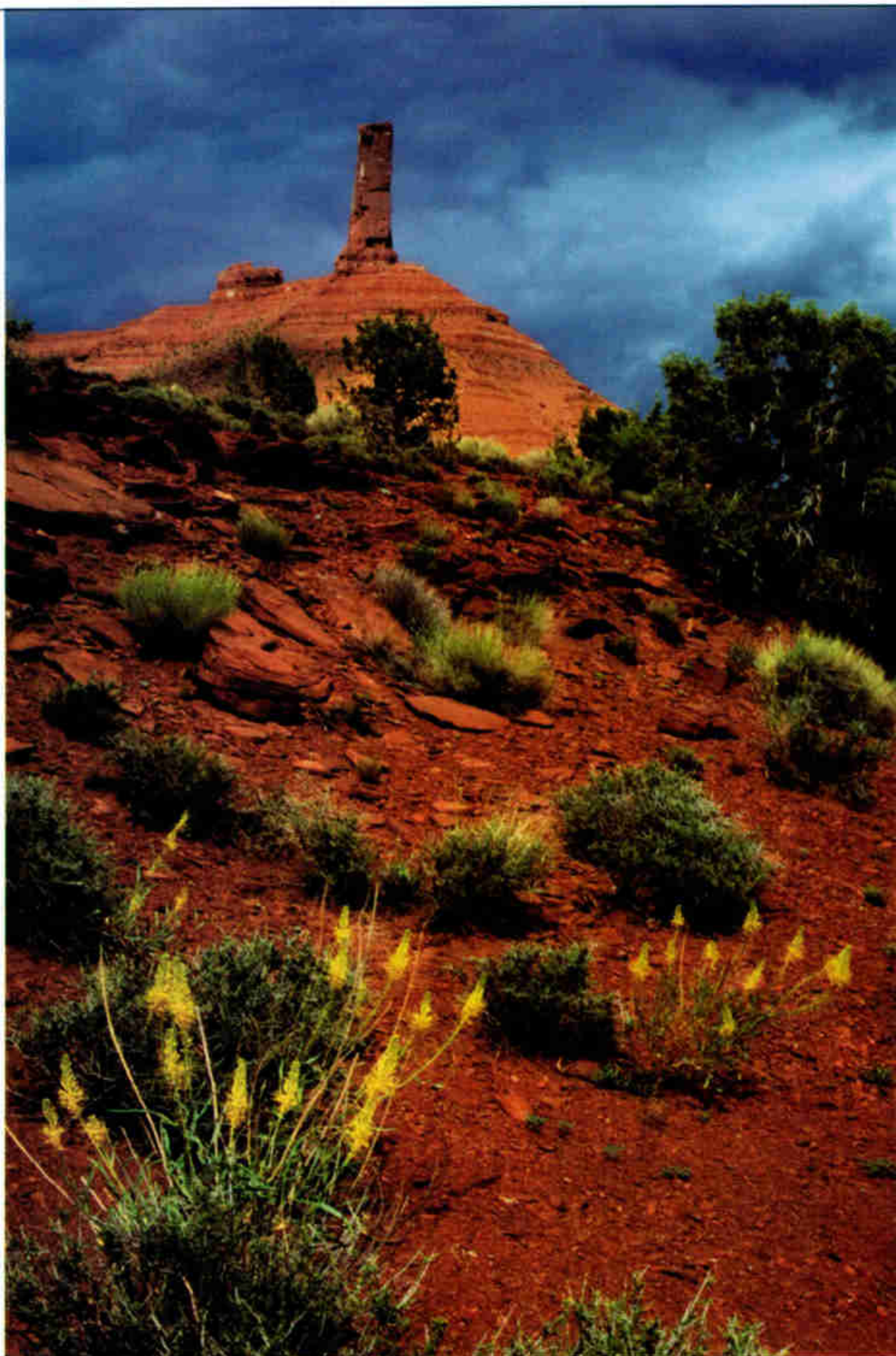
To rock climbers, however, Castleton Tower is more than nice scenery—it's a shrine to their sport. First ascended in 1961, its sheer faces have since attracted thousands.

So when news broke that state land around the base of the tower would be zoned for housing and sold to raise school funds, climbers were among those most alarmed. The rock formation is on federal land and would be unaffected, but climbers feared access might be cut off by gated streets. Some residents in the nearby town of Castle Valley also opposed the development. "If this bit of semiwilderness, which means so much to people, can't be preserved, what can?" said mountaineer and writer Greg Child, a Castle Valley resident.

Utah Open Lands, a preservation group, helped coordinate a plan: raise \$640,000 to buy the land before developers could. Now the group is negotiating with Utah officials to keep more of the area's land off the market and open to all. —Chris Carroll

WEBSITE EXCLUSIVE

Find links and resources selected by our Research Division at nationalgeographic.com/ngm/resources/0309.



DAVID WHITTEN

LAST CALL

End of the Line for NYC Subway Tokens

A fare increase first sent subway tokens jingling into New Yorkers' pockets 50 years ago. Turnstiles couldn't tell nickels from dimes—a problem once the fare hit 15 cents. Brass tokens were the answer, and they worked for future fare hikes too. Now the



ROBERT CLARK

cost of gathering tokens from turnstiles and returning them to fare booths has gotten too high, so the city has abandoned tokens on the subway in favor of electronically scanned MetroCards. The tokens are still usable on New York City buses, but only until December 31. After that, tokens will be worthless—except to collectors.

—Margaret G. Zackowitz



Hispaniolan Crossbill
(*Loxia megalaga*)

Size: Length, 15 cm

Weight: 24 - 28 g

Habitat: High-altitude pine forests on the island of Hispaniola (Haiti and Dominican Republic). Vagrant to Jamaica

Surviving number: Last estimated in 1994 at fewer than 1,000 pairs

Photographed by Eladio Fernández

WILDLIFE AS CANON SEES IT

There's no place like home. This is more than just sentiment where the Hispaniolan crossbill is concerned. The striking bird is perfectly adapted to its habitat—perhaps too perfectly. Its crossed mandibles are the ideal tool for extracting seeds from the sole native conifer. But this specialization makes it dangerously dependent: any threat to the high pine forests in which it nests and forages is a threat to the crossbill. And the

peril has been growing in recent years. Deforestation and its more subtle effects, such as disruption of the normal fire cycle, threaten the only place in the world the Hispaniolan crossbill can call home.

As an active, committed global corporation, we join worldwide efforts to promote awareness of endangered species. Just one way we are working to make the world a better place—today and tomorrow.



Proposed Messina Strait Bridge
Length of main span: 10,827 feet
Height of towers: 1,255 feet

Golden Gate Bridge
Length of main span: 4,200 feet
Height of towers: 746 feet

ART BY C. BRUCE MORSE

ENGINEERING

Monster Bridge for Italy?

Ancient travelers crossing the turbulent waters that separate Sicily from mainland Italy encountered such frequent hazards that storytellers invented sea monsters to help people make sense of it all.

Though little danger exists in today's 30-minute ferry ride across the Strait of Messina, planners eager to speed up the crossing imagine a new kind of colossus. Work is scheduled to begin in 2005 on the world's largest suspension bridge—the first permanent link between Sicily and the Italian mainland. When finished in 2011, the main span of 2.05 miles (suspension bridges are ranked by length

of the main span) would nearly double that of the current record holder in Japan, while San Francisco's Golden Gate Bridge would be dwarfed (comparison shown above).

But environmentalists point to a real-life bogey in the strait: an underwater fault that caused a 1908 quake, killing as many as 100,000 people in Messina. An engineering study showed that the bridge would likely survive another magnitude 7.1 quake. But as the project moves through government agencies toward construction, opponents say the risks are too great and the benefits too small to justify the 5.5-billion-dollar price tag. —Chris Carroll



World's Five Longest Suspension Bridges

Akashi Kaikyo Bridge. Links city of Kobe and Awaji Shima island in Japan's Inland Sea. Main span: 6,532 feet. Opened 1998.

Great Belt East Bridge. Connects Denmark's Fyn and Zealand islands. 5,328 feet. 1998.

Humber Bridge. Humber estuary, east England. 4,626 feet. 1981.

Jiangyin Bridge. Yangtze River crossing near Shanghai. 4,542 feet. 1999.

Tsing Ma Bridge, Hong Kong, China. 4,515 feet. 1997.

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ADVENTURE

Flying With Falcons

The best way to measure how fast they dive? Join 'em



“I was falling like the proverbial stone,” says sky diver and filmmaker Leo Dickinson (left), “but sometimes it feels like our trained peregrine falcons don’t play by the same rules of gravity.”

Often called the world’s fastest bird, the peregrine’s speed is legendary—and conjectural.

Estimates of the speed of its dives, or stoops, range from 100 to more than 200 miles an hour.

Attempting to make precise

measurements, Dick-

inson’s team went

skydiving with

the birds, jump-

ing with them from

planes, balloons, and here

from a 3,000-foot-tall cliff

in the Italian Alps. The birds,

released after the divers, dive

down to seize beef attached

to a yellow lure. On some

jumps the birds wore a

small device to measure

their speed. Still analyz-

ing the data, the team cal-

culates that one bird reached

more than 200 miles an hour.

—John L. Eliot

Speed Freaks

Peregrines may be the fastest divers, but at their level flapping speed of 30 to 60 miles an hour, they’d be eating the dust of a few other birds. Some champion animal fliers:

Fastest birds (level flight) Racing pigeons and dunlin sandpipers can hit speeds of 110 mph, with red-breasted merganser ducks (100 mph) close behind.

Fastest mammals Mexican free-tailed bats can reach 48 mph, and other free-tailed species are suspected to be even faster.

Fastest insects Little reliable data. Moths called black cutworms have been clocked at 70 mph, but they cheat: They migrate by riding cold fronts.

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Behind the SCENES

AT THE NATIONAL GEOGRAPHIC SOCIETY



A Rain Forest Rolls In

Mobile jungle visits kids

Imagine you're nine. On an average school day in February, a 53-foot semi appears in the snow. You go inside, where it's warm, full of trees and bird noises, and smells of rain forest products like vanilla, coffee, and chocolate. You're given a job. "I



NGS PHOTOGRAPHER MARK THIESSEN (BOTH)

was an ichthyologist—that's a fish scientist," explains Jovante Carter (with test tube) of Raymond Elementary School in Washington, D.C. The city's Discovery Creek Children's Museum

created the Rolling Rainforest, a model of a New World jungle with replicas of tropical flora and fauna (plus live spiders and snakes), with support from the Society's Geography Education Foundation. Simple experiments help children recognize the value of rain forests. "If we cut the trees, we won't be able to breathe," says Osmin Villalta (above, at right). The exhibit has been so popular in the Washington area that it's now traveling to schools across the country.

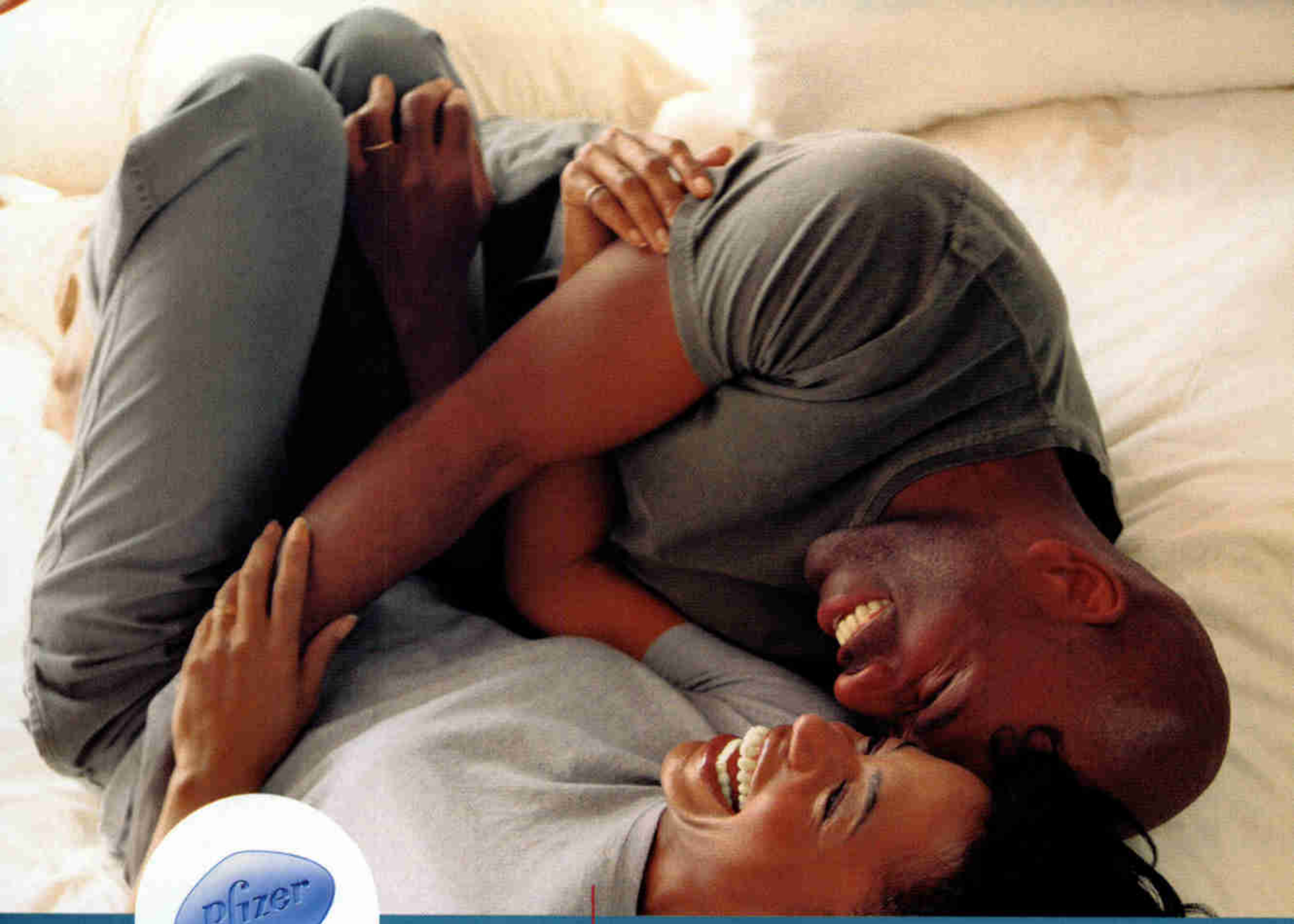
Crash Course

He walked 2,000 miles through central Africa's forests and suffered nothing worse than foot worms. But Mike Fay nearly met his end

on a recent trip to Gabon's coast when a two-ton elephant attacked. "It was like a Land Cruiser on top of me," says Fay. Tusks gored his arms and knee, but he escaped with his life. Now he's walking the 13 Gabonese parks he helped create (see page 50).



AHAB DOWNER



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VIAGRA is indicated for the treatment of erectile dysfunction. Remember that no medicine is for everyone. If you use nitrate drugs, often used to control chest pain (also known as angina), don't take VIAGRA. This combination could cause your blood pressure to drop to an unsafe or life-threatening level.

Discuss your general health status with your doctor to ensure that you are healthy enough to engage in sexual activity. If you experience chest pain, nausea, or any other discomforts during sex or an erection that lasts longer than 4 hours, seek immediate medical help. The most common side effects of VIAGRA are headache, facial flushing, and upset stomach. Less commonly, bluish vision, blurred vision, or sensitivity to light may briefly occur.

Please see patient summary of information for VIAGRA (25-mg, 50-mg, 100-mg) tablets on the following page.

Join the millions.



PATIENT SUMMARY OF INFORMATION ABOUT

VIAGRA® (sildenafil citrate) tablets

This summary contains important information about VIAGRA®. It is not meant to take the place of your doctor's instructions. Read this information carefully before you start taking VIAGRA. Ask your doctor or pharmacist if you do not understand any of this information or if you want to know more about VIAGRA.

This medicine can help many men when it is used as prescribed by their doctors. However, VIAGRA is not for everyone. It is intended for use only by men who have a condition called erectile dysfunction. **VIAGRA must never be used by men who are taking medicines that contain nitrates of any kind, at any time. This includes nitroglycerin. If you take VIAGRA with any nitrate medicine your blood pressure could suddenly drop to an unsafe or life threatening level.**

What Is VIAGRA?

VIAGRA is a pill used to treat erectile dysfunction (impotence) in men. It can help many men who have erectile dysfunction get and keep an erection when they become sexually excited (stimulated).

You will not get an erection just by taking this medicine. VIAGRA helps a man with erectile dysfunction get an erection only when he is sexually excited.

How Sex Affects the Body

When a man is sexually excited, the penis rapidly fills with more blood than usual. The penis then expands and hardens. This is called an erection. After the man is done having sex, this extra blood flows out of the penis back into the body. The erection goes away. If an erection lasts for a long time (more than 6 hours), it can permanently damage your penis. You should call a doctor immediately if you ever have a prolonged erection that lasts more than 4 hours.

Some conditions and medicines interfere with this natural erection process. The penis cannot fill with enough blood. The man cannot have an erection. This is called erectile dysfunction if it becomes a frequent problem.

During sex, your heart works harder. Therefore sexual activity may not be advisable for people who have heart problems. Before you start any treatment for erectile dysfunction, ask your doctor if your heart is healthy enough to handle the extra strain of having sex. If you have chest pains, dizziness or nausea during sex, stop having sex and immediately tell your doctor you have had this problem.

How VIAGRA Works

VIAGRA enables many men with erectile dysfunction to respond to sexual stimulation. When a man is sexually excited, VIAGRA helps the penis fill with enough blood to cause an erection. After sex is over, the erection goes away.

VIAGRA Is Not for Everyone

As noted above (*How Sex Affects the Body*), ask your doctor if your heart is healthy enough for sexual activity.

If you take any medicines that contain nitrates—either regularly or as needed—you should never take VIAGRA. If you take VIAGRA with any nitrate medicine or recreational drug containing nitrates, your blood pressure could suddenly drop to an unsafe level. You could get dizzy, faint, or even have a heart attack or stroke. Nitrates are found in many prescription medicines that are used to treat angina (chest pain due to heart disease) such as:

- nitroglycerin (sprays, ointments, skin patches or pastes, and tablets that are swallowed or dissolved in the mouth);
- isosorbide mononitrate and isosorbide dinitrate (tablets that are swallowed, chewed, or dissolved in the mouth)

Nitrates are also found in recreational drugs such as amyl nitrate or nitrite ("poppers"). If you are not sure if any of your medicines contain nitrates, or if you do not understand what nitrates are, ask your doctor or pharmacist.

VIAGRA is only for patients with erectile dysfunction. VIAGRA is not for newborns, children, or women. Do not let anyone else take your VIAGRA. VIAGRA must be used only under a doctor's supervision.

What VIAGRA Does Not Do

- VIAGRA does not cure erectile dysfunction. It is a treatment for erectile dysfunction.
- VIAGRA does not protect you or your partner from getting sexually transmitted diseases, including HIV—the virus that causes AIDS.
- VIAGRA is not a hormone or an aphrodisiac.

What To Tell Your Doctor Before You Begin VIAGRA

Only your doctor can decide if VIAGRA is right for you. VIAGRA can cause mild, temporary lowering of your blood pressure. You will need to have a thorough medical exam to diagnose your erectile dysfunction and to find out if you can safely take VIAGRA alone or with your other medicines. Your doctor should determine if your heart is healthy enough to handle the extra strain of having sex.

Be sure to tell your doctor if you:

- have ever had any heart problems (e.g., angina, chest pain, heart failure, irregular heart beats, heart attack or narrowing of the aortic valve)
- have ever had a stroke
- have low or high blood pressure
- have a rare inherited eye disease called retinitis pigmentosa
- have ever had any kidney problems
- have ever had any liver problems
- have ever had any blood problems, including sickle cell anemia or leukemia

- are allergic to sildenafil or any of the other ingredients of VIAGRA tablets
- have a deformed penis, Peyronie's disease, or ever had an erection that lasted more than 4 hours
- have stomach ulcers or any types of bleeding problems
- are taking any other medicines

VIAGRA and Other Medicines

Some medicines can change the way VIAGRA works. Tell your doctor about **any medicines** you are taking. Do not start or stop taking any medicines before checking with your doctor or pharmacist. This includes prescription and nonprescription medicines or remedies.

- Remember, VIAGRA should never be used with medicines that contain nitrates (see *VIAGRA Is Not for Everyone*).
- If you are taking alpha-blocker therapy for the treatment of high blood pressure or prostate problems, you should not take a dose of greater than 25 mg of VIAGRA at the same time (within 4 hours) as you take your dose of alpha-blocker.
- If you are taking a protease inhibitor, your dose may be adjusted (please see *Finding the Right Dose for You*.)
- VIAGRA should not be used with any other medical treatments that cause erections. These treatments include pills, medicines that are injected or inserted into the penis, implants or vacuum pumps.

Finding the Right Dose for You

VIAGRA comes in different doses (25 mg, 50 mg and 100 mg). If you do not get the results you expect, talk with your doctor. You and your doctor can determine the dose that works best for you.

- Do not take more VIAGRA than your doctor prescribes.
- If you think you need a larger dose of VIAGRA, check with your doctor.
- VIAGRA should not be taken more than once a day.

If you are older than age 65, or have serious liver or kidney problems, your doctor may start you at the lowest dose (25 mg) of VIAGRA. If you are taking protease inhibitors, such as for the treatment of HIV, your doctor may recommend a 25 mg dose and may limit you to a maximum single dose of 25 mg of VIAGRA in a 48 hour period. If you are taking alpha-blocker therapy, you should not take a dose of greater than 25 mg of VIAGRA at the same time (within 4 hours) as your dose of alpha-blocker.

How To Take VIAGRA

Take VIAGRA about one hour before you plan to have sex. Beginning in about 30 minutes and for up to 4 hours, VIAGRA can help you get an erection if you are sexually excited. If you take VIAGRA after a high-fat meal (such as a cheeseburger and french fries), the medicine may take a little longer to start working. VIAGRA can help you get an erection when you are sexually excited. You will not get an erection just by taking the pill.

Possible Side Effects

Like all medicines, VIAGRA can cause some side effects. These effects are usually mild to moderate and usually don't last longer than a few hours. Some of these side effects are more likely to occur with higher doses. The most common side effects of VIAGRA are headache, flushing of the face, and upset stomach. Less common side effects that may occur are temporary changes in color vision (such as trouble telling the difference between blue and green objects or having a blue color tinge to them), eyes being more sensitive to light, or blurred vision.

In rare instances, men have reported an erection that lasts many hours. You should call a doctor immediately if you ever have an erection that lasts more than 4 hours. If not treated right away, permanent damage to your penis could occur (see *How Sex Affects the Body*).

Heart attack, stroke, irregular heart beats, and death have been reported rarely in men taking VIAGRA. Most, but not all, of these men had heart problems before taking this medicine. It is not possible to determine whether these events were directly related to VIAGRA.

VIAGRA may cause other side effects besides those listed on this sheet. If you want more information or develop any side effects or symptoms you are concerned about, call your doctor.

Accidental Overdose

In case of accidental overdose, call your doctor right away.

Storing VIAGRA

Keep VIAGRA out of the reach of children. Keep VIAGRA in its original container. Store at 25°C (77°F); excursions permitted to 15-30°C (59-86°F) [see USP Controlled Room Temperature].

For More Information on VIAGRA

VIAGRA is a prescription medicine used to treat erectile dysfunction. Only your doctor can decide if it is right for you. This sheet is only a summary. If you have any questions or want more information about VIAGRA, talk with your doctor or pharmacist, visit www.viagra.com, or call 1-888-4VIAGRA. 23-5515-00-6

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Chris Johns

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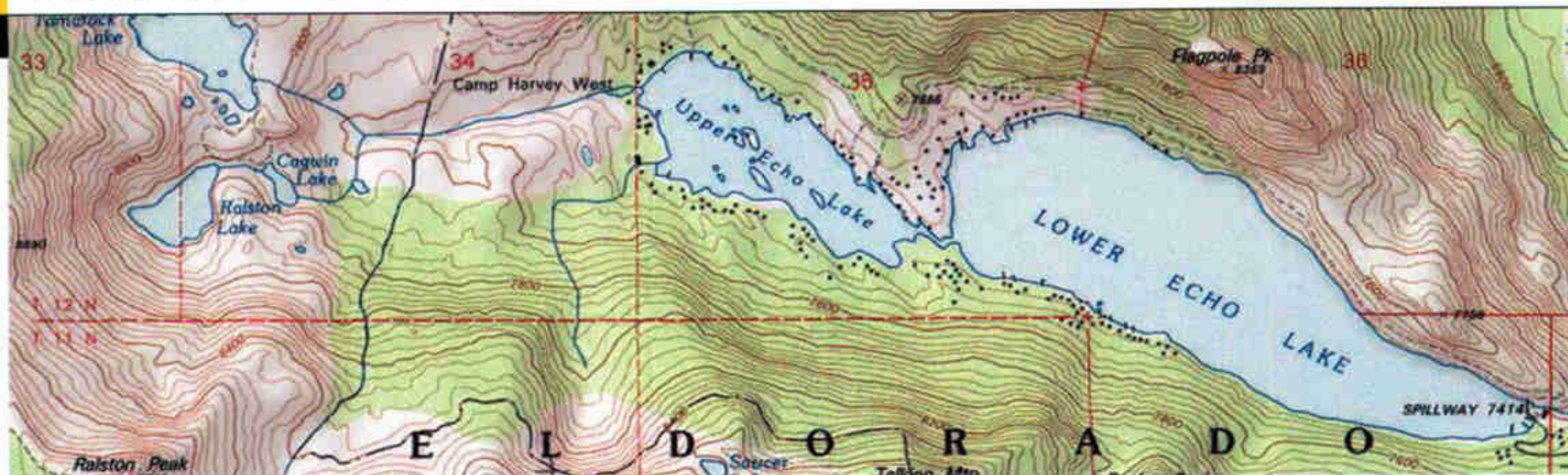
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It began in 1994 with a simple idea: Create CD-ROMs with topographic maps of San Francisco and Yosemite National Park to enable climbers, hikers, or bikers to plan outdoor activities in detail. Since then National Geographic Maps has scanned more than 55,000 U.S. Geological Survey topographic maps to produce the TOPO! Interactive

Maps series. CD-ROMs are now available for all 50 states, plus many popular recreational regions—from the Great Smoky Mountains to Colorado's Front Range to the Olympic Peninsula. “People will never have to tape paper topo maps together again,” says Matt Heller of NG Maps. “You can print out a map centered on any location, and use tools to see how long a hike will take or how much change in elevation you’ll find.”

Users can electronically plot

their route on a TOPO! map on their home computer, then load it into a GPS handheld unit. In the field, you can instantly see the distance to your destination and know what direction to walk, bike, or ski. “The GPS receiver tells you where you are

on the map,” says Matt. “You can still get lost, but it’s a lot harder.” Users also can add favorite trail stops and other data to their maps and share them online at nationalgeographic.com/mapxchange.

The TOPO! sets sell for \$24.95 for a specific region and \$99.95 for an entire state. They may be purchased at nationalgeographic.com/topo, or at map and travel stores, outdoor gear retailers, and national park outlets.



SPECIAL EDITION POSTER

Life in a Parallel Universe

“You need to stay with zebras for weeks on end to witness special moments,” says photographer Anup Shah, who with his brother, Manoj, shot our current poster pick: mothers and foals in Kenya’s Masai Mara National Reserve. Zebra mothers keep foals close—and chase other herd members away—so babies can learn to recognize mom by her smell, sound, and stripe pattern.

The poster is available for \$39.95 plus \$6.95 for shipping (\$9.95 for international orders). Please add appropriate sales tax for orders sent to CA, DC, FL, KY, MI, PA, VA, VT, and Canada. We will produce only as many 24-by-30-inch posters as we receive orders for by October 31, 2003. Each will be hand-numbered and embossed with the Society seal. Shipping is scheduled for December 2003. Call toll free: 1-888-647-7301 (outside the U.S. and Canada call 1-515-362-3353) or order online at nationalgeographic.com/ngm.



NGM P09

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GABON'S NATIONAL PARKS (PAGE 50)

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Who Knew?

HUMAN BEHAVIOR

Time to Hit the Panic Button?

How we decide what's risky

Modern life requires us to be risk analyzers. Every day we size up our chances of being killed by terrorists, epidemics, and vicious All-U-Can-Eat buffets. At Who Knew? our policy is to ward off danger by whistling. Deciding when to whistle is the hard part.

True story: On the morning of September 11, 2001, with the Pentagon billowing smoke, Washington, D.C., went into a state of emergency. Rumors flew of explosions all around town. But near the Federal Reserve, I came across a man sitting calmly on a park bench, reading the newspaper. He had no interest in joining the evacuation or even listening to the latest news bulletin. He said he figured the danger was over and went back to his stock listings.

It's worth noting that most of us, as a rule, don't panic in disasters. We don't run screaming down the street, knocking over baby carriages. That's Hollywood. Sociologists have found that it's more typical for people to help others in the heat of the moment, which was certainly true on 9/11.

The park bench man was a couple of miles from the burning Pentagon but still in the heart of a likely target area for terrorists. Why didn't he flee? Maybe he had reasoned through the situation carefully and determined it was safe to examine his portfolio. Or was he going on gut instinct?

Psychologists believe that people use two different mental systems for thinking about risk. The first is logical and analytical. The other is intuitive and emotional. The intuitive

system is based on images burned into your brain during past experiences—and it often trumps the analytical one. Hard facts may say you're in no danger, but you think: Something here doesn't feel right.

Gut instinct has helped us survive over the course of human evolution. But gut instinct can backfire. It may not warn us of dangers from unfamiliar sources. (Who expected planes to turn into missiles on that sunny September morning?)

Feelings alone can also cause us to make illogical calculations. A 1993 experiment offered people a chance to win a dollar by drawing a red jelly bean from one of two bowls. One bowl had 100 beans, 7 of them red. The other had 10 beans, only 1 red. Many people preferred the bowl with the 7 red beans. They knew their odds were worse, but they said they *felt* as if they had a better chance.

In another experiment clinicians were far more likely to release a mental patient from a hospital if told he had a 20 percent chance of becoming violent than if told 20 out of 100 such patients would become violent. The second scenario, though statistically equivalent to the first, created a visual image of violent patients.

A savvy risk analyzer uses both the emotional and analytical systems to make good decisions, says psychologist Paul Slovic of the University of Oregon. "You need your feelings to put a cross-check on your analysis, and you need analysis to keep your feelings in check."

So keep your wits in an emergency. Analyze your situation. Crunch the numbers. But don't be so logical you forget to run for your life.

—Joel Achenbach

WASHINGTON POST STAFF WRITER

IT MATTERS

To do good risk analysis you have to know how often bad things happen.

Counting the lapel ribbons and celebrity spokespersons devoted to a particular health risk won't give you reliable data. Take cancer, for instance. American women are most frightened of breast cancer, even though lung cancer is the malignancy that kills them most. (Fact: Nearly 90 percent of lung cancer deaths are directly attributable to smoking.) And there are worse risks: Rape and domestic violence deprive women worldwide of more years of healthy life than all forms of cancer combined, according to a World Bank study. Knowing what's most hazardous to our health matters. Such knowledge can shape personal choices and help determine how public health resources are used.

—Lynne Warren

WEBSITE EXCLUSIVE

Learn more about risk analysis—and find links to Joel Achenbach's work—at nationalgeographic.com/ngm/resources/0309.

By Andrew Cockburn • Photographs by Jodi Cobb National Geographic Photographer

The headline below is not a metaphor. This story is about slaves. Not people living *like* slaves, working hard for lousy pay. Not people 200 years ago. It's about 27 million people worldwide who are bought and sold, held captive, brutalized, exploited for profit. It's about

21ST CENTURY SLAVES



In a dim, airless room in northern India, a dozen children bend over gas burners making bracelets that sell for 40 cents a dozen. These children, between 9 and 14 years old, work ten hours a day, every day—traded by their parents to the workshop owner for cash. The average sum that enslaves an Indian child? \$35.

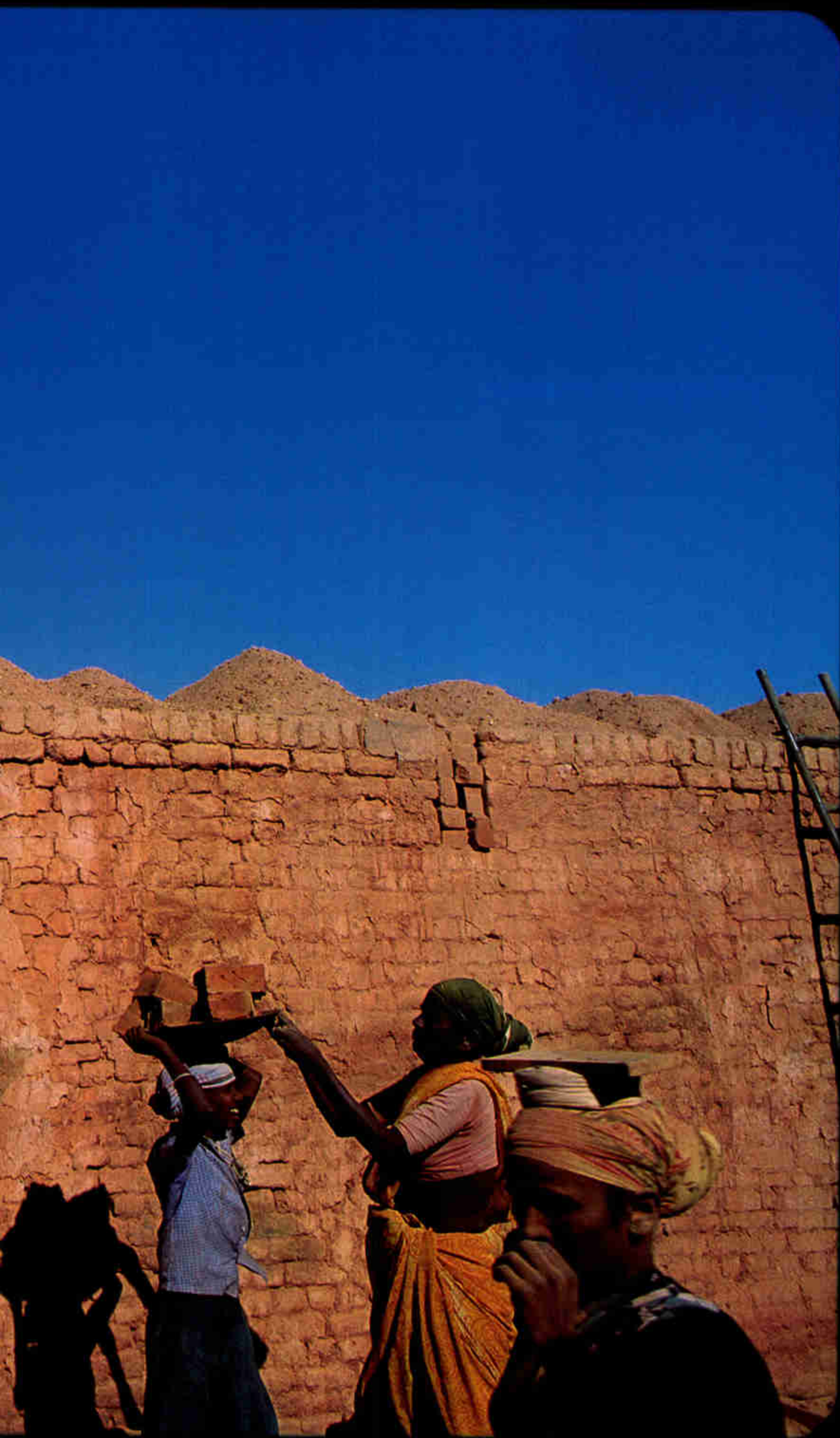




Unlike drugs, a woman's body can be **sold** over and over

Owners of Israeli brothels, like this one in Tel Aviv, can buy young women from Moldova or Ukraine for around \$4,000 each. With ten prostitutes to service customers, even a small operation can make a million dollars a year. Traffickers posing as employment agents find victims in poor Eastern European towns and lure them abroad with promises of good jobs. When the women arrive—in Israel, Germany, Switzerland, Japan, the U.S.—they're delivered to buyers who typically beat, rape, or terrorize them into compliance.





Debt traps entire families in **bondage** for generations

Mothers and daughters haul handmade bricks at a southeast India kiln while fathers and sons stoke the fires. Kiln owners acquire workers by loaning poor families money for expenses far beyond their means: medical care or a funeral. Despite years of work to pay these loans, exorbitant interest and dishonest accounting perpetuate the debts, and parents pass the burdens on to their children. Roughly two-thirds of the world's captive laborers—15 to 20 million people—are debt slaves in India, Pakistan, Bangladesh, and Nepal.

Sherwood Castle, headquarters to Milorad Milakovic, the former railway official who rose to become a notorious slave trafficker in Bosnia, looms beside the main road just outside the northwest Bosnian town of Prijedor. Under stucco battlements, the entrance is guarded by well-muscled, heavily tattooed young men, while off to one side Milakovic's trio of pet Siberian tigers prowl their caged compound.

I arrived there alone one gray spring morning—alone because no local guide or translator dared accompany me—and found my burly 54-year-old host waiting for me at a table set for lunch beside a glassed-in aquamarine swimming pool.

The master of Sherwood has never been shy about his business. He once asked a dauntless human rights activist who has publicly detailed his record of buying women for his brothels in Prijedor: "Is it a crime to sell women? They sell footballers, don't they?"

Milakovic threatened to kill the activist for her outspokenness, but to me he sang a softer tune. Over a poolside luncheon of seafood salad and steak, we discussed the stream of young women fleeing the shattered economies of their home countries in the former Soviet bloc. Milakovic said he was eager to promote his scheme to legalize prostitution in Bosnia—"to stop the selling of people, because each of those girls is someone's child."

One such child is a nearsighted, chain-smoking blonde named Victoria, at 20 a veteran of the international slave trade. For three years of her life she was among the estimated 27 million men, women, and children in the world who are enslaved—physically confined or restrained and forced to work, or controlled through violence, or in some way treated as property.

Victoria's odyssey began when she was 17, fresh out of school in Chisinau, the decayed capital of the former Soviet republic of Moldova. "There was no work, no money," she explained simply. So when a friend—"at least I thought he was a friend"—suggested he could help her get a job in a factory in Turkey, she jumped at the idea and took up his offer to drive her there, through Romania. "But when I realized we had driven west, to the border with Serbia, I knew something was wrong."

It was too late. At the border she was handed

over to a group of Serb men, who produced a new passport saying she was 18. They led her on foot into Serbia and raped her, telling her that she would be killed if she resisted. Then they sent her under guard to Bosnia, the Balkan republic being rebuilt under a torrent of international aid after its years of genocidal civil war.

Victoria was now a piece of property and, as such, was bought and sold by different brothel owners ten times over the next two years for an average price of \$1,500. Finally, four months pregnant and fearful of a forced abortion, she escaped. I found her hiding in the Bosnian city of Mostar, sheltered by a group of Bosnian women.

In a soft monotone she recited the names of clubs and bars in various towns where she had to dance seminaked, look cheerful, and have sex with any customer who wanted her for the price of a few packs of cigarettes. "The clubs were all awful, although the Artemdia, in Banja Luka, was the worst—all the customers were cops," she recalled.

Victoria was a debt slave. Payment for her services went straight to her owner of the moment to cover her "debt"—the amount he had paid to buy her from her previous owner. She was held in servitude unless or until the money she owed to whomever controlled her

had been recovered, at which point she would be sold again and would begin to work off the purchase price paid by her new owner. Although slavery in its traditional form survives in many parts of the world, debt slavery of this kind, with variations, is the most common form of servitude today.

According to Milorad Milakovic, such a system is perfectly aboveboard. "There is the problem of expense in bringing a girl here," he had explained to me. "The plane, transport, hotels along the way, as well as food. That girl must work to get that money back."

In November 2000 the UN-sponsored International Police Task Force (IPTF) raided Milakovic's nightclub-brothels in Prijedor, liberating 34 young women who told stories of servitude similar to Victoria's. "We had to dance, drink a lot, and go to our rooms with anyone," said one. "We were eating once a day and sleeping five to six hours. If we would not do what we were told, guards would beat us."

Following the IPTF raids, Milakovic complained to the press that the now liberated women had cost a lot of money to buy, that he would have to buy more, and that he wanted compensation. He also spoke openly about the cozy relations he had enjoyed with the IPTF peacekeepers, many of whom had been his customers.

But there were no influential friends to protect him in May this year, when local police finally raided Sherwood Castle and arrested Milakovic for trafficking in humans and possessing slaves.

We think of slavery as something that is over and done with, and our images of it tend to be grounded in the 19th century: black field hands in chains. "In those days slavery thrived on a shortage of person power," explains Mike Dottridge, former director of Anti-Slavery International, founded in 1839 to carry on the campaign that had already abolished slavery in the British Empire. The average slave in 1850, according to the research of slavery expert Kevin Bales, sold for around \$40,000 in today's money.

I visited Dottridge at the organization's headquarters in a small building in Stockwell, a non-descript district in south London. "Back then," said Dottridge, "black people were kidnapped and forced to work as slaves. Today vulnerable people are lured into debt slavery in the expectation of

a better life. There are so many of them because there are so many desperate people in the world."

The offices are festooned with images of contemporary slavery—forced labor in West Africa, five- and six-year-old Pakistani children delivered to the Persian Gulf to serve as jockeys on racing camels, Thai child prostitutes. File cabinets bulge with reports: Brazilian slave gangs hacking at the Amazon rain forest to make charcoal for the steel industry, farm laborers in India bound to landlords by debt they have inherited from their parents and will pass on to their children.

The buying and selling of people is a profitable business because, while globalization has made it easier to move goods and money around the world, people who want to move to where jobs are face ever more stringent restrictions on legal migration.

Almost invariably those who cannot migrate legally or pay fees up front to be smuggled across borders end up in the hands of trafficking mafias. "Alien smuggling [bringing in illegal aliens who then find paying jobs] and human trafficking [where people end up enslaved or sold by the traffickers] operate exactly the same way, using the same routes," said a veteran field

**"Is it a crime to sell women? They sell footballers, don't they?"
Milorad Milakovic,
after his brothels
in Prijedor were raided,
complained that
the now liberated
women had cost a lot
of money to buy
... and that he wanted
compensation.**

agent from the U.S. Immigration and Naturalization Service (INS). "The only difference is what happens to people at the other end." As the fees people must pay for transport rise in step with tightening border controls, illegal immigrants are ever more likely to end up in debt to the traffickers who have moved them—and are forced to work off their obligations as slaves.

It's dangerous for outsiders to show too close an interest in how these trafficking mafias work (a point that had occurred to me at Sherwood Castle), but in Athens I found a man who has made the study of slave trafficking his specialty and lives to tell the tale.

In 1990 Grigoris Lazos, a sociology professor at Panteion University, embarked on what he thought would be straightforward research on prostitution in Greece. Bright and intense, he resolved to go straight to the source, the prostitutes themselves. Through them he eventually made contact with the people who had enslaved them. Over the course of a decade—and in the face of intense disapproval from his professional colleagues—Lazos gained access to trafficking operations from the inside and was able to paint a clear picture of the interplay between prostitution and slavery in his country.

"You should note the difference between a small trafficking gang and a large network, which uses the Internet and bank accounts," he said. "Any bar owner or group of bar owners in Greece can send someone up to southern Bulgaria to buy women for cash. The cost of a girl in that area is \$1,000, or, if you negotiate, you might be able to get two for \$1,000. Best to try on a Monday for cheap prices, because most trafficking happens at the weekends. Mondays are slow, so you can get the leftovers."

"A network on the other hand," he continued, "has the ability to bargain and complete financial transactions from a distance. Simply call Moscow, ask for women, and they will be sent to Romania and from there on through Bulgaria to Greece. The parties don't even have to know each other. The importer simply says, 'I want so-and-so many first quality women, so-and-so many second quality, so-and-so many third quality.'"

Flicking through his exhaustive files, the professor rattled off the cold data of human trade. "Between 1990 and 2000 the total amount earned in Greece from trafficked women, that

is to say those who were forced into this kind of prostitution, was 5.5 billion dollars. Voluntary prostitutes, those who were working of their own accord and are mostly Greek women, earned 1.5 billion dollars."

The efficiency and scope of the Greek traffickers' operations studied by Lazos is by no means unique. In Trieste, the gateway from the Balkans into northern Italy, investigators from the local anti-mafia commission tracked the activities of Josip Loncaric, a former taxi driver from Zagreb, Croatia.

By the time Loncaric was finally arrested in 2000 he owned airlines in Albania and Macedonia and was involved in moving thousands of people destined for work not only in prostitution but in any menial task requiring cheap labor in the prosperous world of the European Union. His Chinese wife, who was also his business partner, provided a link to criminal Chinese triads with which Loncaric did profitable business smuggling Chinese as well as Kurds, Iraqis, Iranians, and any other afflicted people willing to mortgage themselves in hopes of a better future. Many of Loncaric's Chinese victims found themselves locked up and forced to work 18 hours a day in restaurants or in the famous Italian leather workshops.

Trafficking mafias and smugglers, in the last decade of the 20th century, brought 35,000 people a year into Western Europe through the Trieste area, guiding them at night through the rugged mountains and forests straddling the border with Slovenia. But this is only one of many funnels between poor worlds and rich ones. Thousands of miles away I found another flood of migrants fleeing Central America on their way to El Norte, the United States, where they could ultimately become slaves.

These migrants' homes were ravaged by the wars of the 1980s and '90s and reduced to further ruin by a succession of natural and man-made disasters. Hurricane Mitch pounded Honduras and Nicaragua in 1998; afterward the number of homeless street children in Central America jumped by 20 percent. El Salvador was hit by a 7.6 earthquake in 2001. Large parts of the region have been without rain for the past three years, and the world price of coffee has crashed, ruining the Central American

coffee industry and leaving 600,000 workers unemployed. In Guatemala more than half a million coffee workers face starvation.

Many economists argue that the North American Free Trade Agreement has made its own contribution to the flood of people trying to move north, maintaining that cheap U.S. corn imported into Mexico has effectively driven millions of Mexican peasant corn farmers out of business and off the land. They suggest that for every ton of corn imported into Mexico, two Mexicans migrate to the U.S.

The tiny Guatemalan town of Tecún Umán lies on the bank of the Suchiate River. Here migrants from Central America gather to cross into Mexico on their way north. Those with valid travel documents for Mexico cross the bridge over the river; those without them pay a few cents to be ferried across on rafts made from tractor inner tubes.

No matter where they come from, a great majority of migrants arrive in Tecún Umán penniless, easy prey for the local hoteliers, bar owners, and people smugglers—known as coyotes—who live off the flow of humanity. It is a town where, in the words of one former resident, “everything and everyone is for sale.”

Some of the luckier migrants find a temporary safe haven at Casa del Migrante, a walled compound just a few yards from the muddy riverbank. “Every day, morning and night, I give a speech here,” says the Casa’s director, Father Ademar Barilli, a Brazilian Jesuit who remains surprisingly buoyant despite the surrounding misery. “I talk about the dangers of the trip north and urge them to go back. It’s a bad choice to go home, but a worse one to try to go on to the U.S.”

Barilli warns migrants about the bosses in Mexico who may take their precious documents and force them into slavery on remote plantations. He tells them about the brothels in Tapachula, the Mexican town across the river, where girls are forced into prostitution. Most, remembering the misery they have left behind, disregard his warnings. As Adriana, a 14-year-old prostitute in a Tapachula bar, exclaimed when asked if she would consider going home to Honduras: “No, there you die of hunger!”

Despite Barilli and Casa del Migrante, Tecún Umán itself is hardly safe. The week before I arrived, a dead coyote had been dumped just outside the gates of the compound with a

hundred bullets in his body. “People are killed here because of the traffic in people and babies. There are many mafias involved in the business of this town. *Aquí uno no sale en la noche*—Here you don’t go out at night,” Barilli said.

As I calculated the amount of daylight left, Barilli explained what local bar owners say to girls from the buses that roll in every day from the south. “They talk about a job working in a restaurant. But the job is in a bar. After the girl has worked for a while just serving drinks, the owner denounces her to the police and gets her arrested because she has no documents. She is jailed; he bails her out. Then he tells her she is in his debt and must work as a prostitute. The debt never ends, so the girl is a slave.”

Barilli cited a recent case involving a bar named La Taverna on the highway out of town. The owner, a woman, had duped six girls in this fashion. “Some of them got pregnant, and she sold the babies,” he said. Thanks partly to the efforts of a Casa del Migrante lay worker (who afterward went into hiding in response to a flood of very credible death threats), the bar owner was finally arrested and jailed.

Stepped-up security in the wake of 9/11 has made the major obstacle on the road from the south, the border between Mexico and the U.S., more difficult than ever to clear. With heightened control has come a commensurate increase in the price charged by smuggling gangs to take people across: up from an average of about (Continued on page 18)

“The slaves in Lake Placid were invisible. . . . People were playing golf at the retirement community, and right behind them was a slave camp.”

Broken Promise

Countries where slavery is legal: 0

Countries where more than a hundred human beings are known to have been trafficked last year:

Albania, Angola, Armenia, Austria, Bahrain, Bangladesh, Belarus, Belgium, Belize, Benin, Bolivia, Bosnia and Herzegovina, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, China, Colombia, Costa Rica, Croatia, Cuba, Czech Republic, Democratic Republic of the Congo, Denmark, Dominican Republic, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Israel, Italy, Ivory Coast, Jamaica, Japan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Liberia, Lithuania, Macedonia, Malawi, Malaysia, Mali, Mauritius, Mexico, Moldova, Morocco, Mozambique, Myanmar, Nepal, Netherlands, Nicaragua, Niger, Nigeria, North Korea, Norway, Pakistan, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia and Montenegro, Sierra Leone, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uzbekistan, Venezuela, Vietnam, Zambia, Zimbabwe

SOURCE: 2003 U.S. DEPARTMENT OF STATE REPORT ON TRAFFICKING



The boy's parents sent him to the mechanic's shop in Benin's capital, Porto-Novo, to learn a skill. He works all day (above) without rest or pay. He can't go outside without permission. Any disobedience brings a beating. According to Kevin Bales, a leading slavery researcher and director of U.S.-based Free the Slaves, this mix of total domination and economic exploitation defines modern slaveholding. Slaves today are controlled not by legal ownership, but by what Bales calls "the final authority of violence." Slavery may be easier to define than it is to detect, however. Among the estimated 60,000 Chinese now living in Italy, legal and illegal immigrants have been found laboring side by side with slaves. Investigations of immigrant workplaces—like a leather factory near Florence (right)—are often stymied by language barriers and the widespread use of fraudulent identity documents.





Each woman's home is a 4-by-6-foot *pinjara*—Hindi for **Cage**

Brothels line Falkland Road in Mumbai, with the youngest, prettiest women displayed in street-level cages to attract customers day and night. Many women are delivered into these ramshackle hives by traffickers; many others are sold outright by parents or husbands. Some 50,000 women—nearly half shipped a *thousand* miles across India from Nepal—work as prostitutes in this city. Violence, disease, malnutrition, and lack of medical care reduce their life expectancy to less than 40 years.



Stopping Traffic

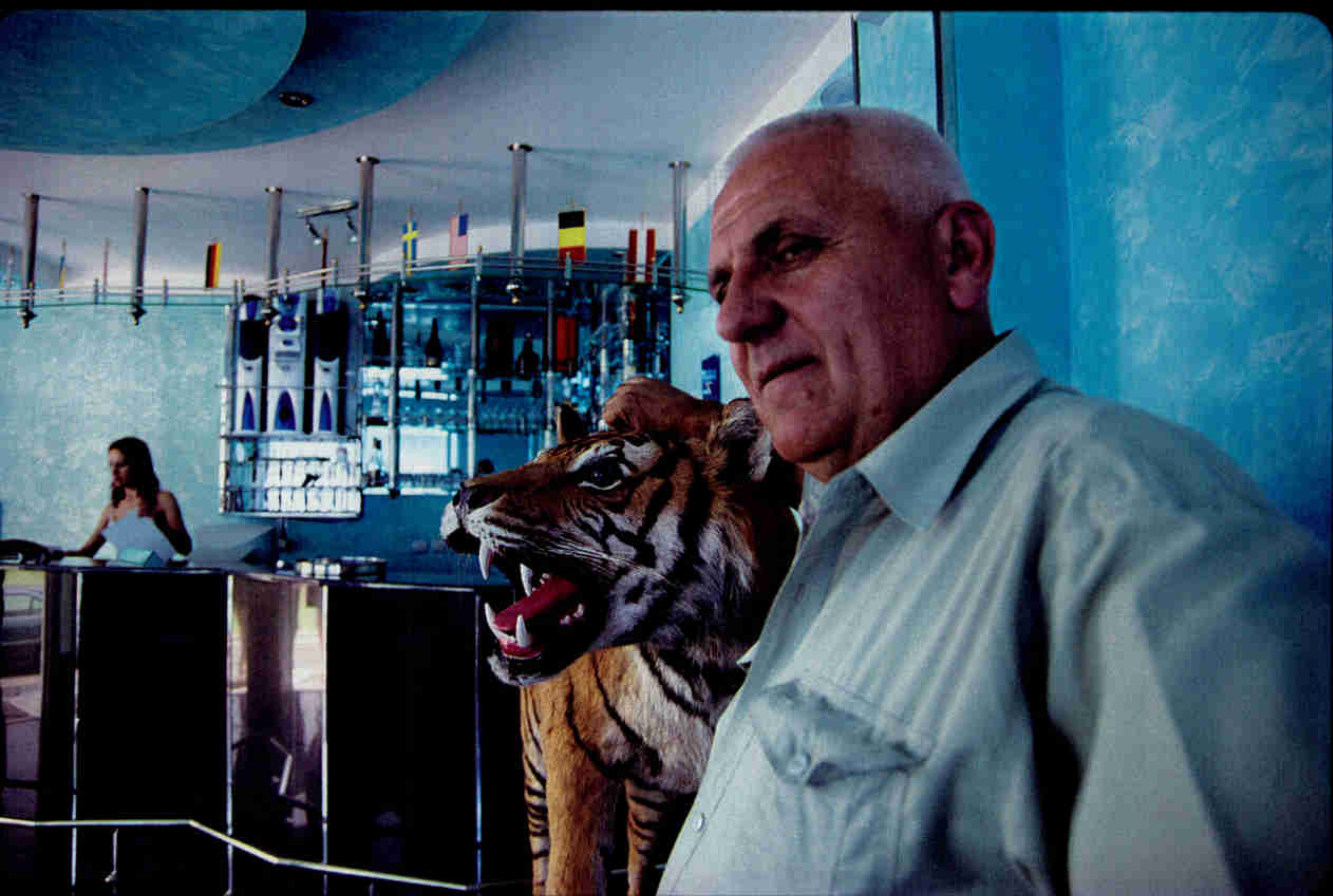
Countries that actively prosecute trafficking in human beings as a serious crime: 25

Prison sentences imposed on some convicted traffickers in the U.S. in 2002:

- Louisa Satia and Kevin Waton Nanji, 9 years each for luring a 14-year-old girl from Cameroon with promises of schooling, then isolating her in their Maryland home, raping her, and forcing her to work as their servant for three years.
- Sardar and Nadira Gasanov, 5 years each for recruiting women from Uzbekistan with promises of jobs, seizing their passports, and forcing them to work in strip clubs and bars in West Texas.
- Fifteen defendants in *U.S. v. Pipkins, et al.*, up to 40 years total for forcing children into prostitution in Atlanta, Georgia. Victims were tortured for disobedience.
- Juan and Ramiro Ramos, 12 years each, and José Luis Ramos, 10 years, for transporting Mexicans to Florida and for forcing them to work as fruit pickers. A local van driver and his employees were brutally beaten for trying to help victims escape.



Convicted trafficker Chandra Gautam (above) will spend 16 years in a Nepalese jail. Long prison sentences and proactive police investigations are part of what the U.S. Department of State calls "a significant effort" by Nepal to stop trade in people. In Bosnia Milorad Milakovic (right) was arrested in May on charges that he buys and sells women through his bar-and-brothel empire. The wealthy Serb says that United Nations international police forces and Bosnian visa and immigration officials have been among his most valued customers. "There's a clear link between slavery and government corruption," says Corbin Lyday, a former official of the U.S. Agency for International Development. "Government officials in dozens of countries assist, overlook, or actively collude with traffickers."



(Continued from page 11) \$1,000 a person to \$2,000. Survivors of the journey arrive deeply indebted and vulnerable to slavers.

In Immokalee, Florida, I sat in a room full of men and women with the same Maya features I had last seen on the faces of the people in Tecún Umán. Almost all of them were farm laborers, toiling on Florida's vast plantations to pick fruit and vegetables consumed all over the U.S. They were meeting at the headquarters of a farmworker organization, the Coalition of Immokalee Workers (CIW), to discuss ways of improving conditions in their ill-paid occupation. When the rapid-fire Spanish conversation died away, an elderly man picked up a guitar and began to sing about Juan Muñoz, who left Campeche, Mexico, "to seek his fortune in the U.S." but ended up in Lake Placid, Florida, working "as a slave" for a cruel boss who stole all his money.

Blues singers composed similar laments about the miseries of plantation life in the Old South, and we think of those songs as part of our heritage. But this song was not about the past. Juan Muñoz is a real person, a 32-year-old who left his small farm in Campeche because he couldn't earn enough money to feed his family. He made his way across the border to Marana, Arizona, where a coyote promised him a ride all the way to a job picking oranges in Florida. The ride cost \$1,000, which Muñoz was told he could pay off over time. On arrival he found he had in fact joined the modern slave economy.

Highway 27 runs through citrus country in the heart of Florida, which supplies 80 percent of U.S. orange juice. The pickers in the fields that line the highway are overwhelmingly immigrants, many undocumented and all poor. They earn an average \$7,500 a year for work that is hard and unhealthy, toiling for bosses who contract with growers to supply crews to pick crops. The law generally leaves these people alone so long as they stick to low-paid but necessary work in the fields.

Sweatshop conditions in the fields are almost inevitable, since the corporations that buy the crops have the power to keep the prices they pay low, thus ensuring that wages paid by harvesting companies to pickers stay low too. These conditions lead to a high turnover in the workforce, since anyone with a prospect of alternative work

swiftly moves on. Hence the appeal to crew bosses of debt-slave crews, whose stability and docility are assured. That is how Juan Muñoz found himself held captive along with at least 700 others in the well-guarded camps operated by the Ramos family in and around the little town of Lake Placid.

"They had almost all been picked up in Arizona by coyotes who offered to take them to Florida and then sold them to the crew bosses," says Romeo Ramirez, a 21-year-old Guatemalan who went undercover to investigate the Ramoses' operation on behalf of the CIW.

Captives in eight camps in and around Lake Placid were living "four to a room, which stank, sleeping on box springs." Not surprisingly, the workers were terrified of their bosses. "People knew they would be beaten for trying to get away," said Ramirez, citing the rumor about one would-be escapee who "had his knees busted with a hammer and then was thrown out of a car moving 60 miles an hour.

"The workers were paid by the growers every Friday," Ramirez continued, "but then they would all be herded to the Ramoses' stores in Lake Placid and forced to sign over their checks. By the time they had paid for rent and food, their debt was as high as ever." One such store, Natalie's Boutique, is a block from the police station.

In April 2001 a team from the CIW helped four of the captive laborers, including Muñoz, to make a break. Spurred to action by the unequivocal testimony of the escapees, the FBI and INS mounted a raid—although the prominent "INS Deportation Service" sign on the side of the bus accompanying the raiding party gave the crew bosses enough warning to send the workers out into the orange groves around Lake Placid to hide. Nevertheless, the brothers Ramiro and Juan Ramos, along with their cousin José Luis Ramos, were eventually charged with trafficking in slaves, extortion, and possession of firearms. In June 2002 the three Ramoses were convicted on all counts and received prison sentences totaling 34 years and 9 months.

This 21st-century slave operation may have been ignored by the Ramoses' corporate clients; and federal agencies may have been slow to react to prodding by the CIW. But the slave crews were hardly out of sight. The main camp in which the Ramoses confined their victims was just on the edge of (Continued on page 23)

I Was Born a Slave

My name is Salma. I was born a slave in Mauritania in 1956. My parents were slaves, and their parents were slaves of the same family. As soon as I was old enough to walk, I was forced to work all day, every day. Even if we were sick, we had to work.

When I was still a child, I started taking care of the first wife of the head of the family and her 15 children. Later, even if one of my own children was hurt or in danger, I didn't dare help my child, because I had to care for the master's wife's children first. I was beaten very often, with a wooden stick or leather belt. One day they were beating my mother, and I couldn't stand it. I tried to stop them. The head of the family got very angry with me. He tied my hands, and branded me with a burning iron, and hit me across the face. His ring cut my face and left a scar.

I was never allowed to go to school or learn anything more than some Koran verses and prayers. But I was lucky, because the eldest son of the master had gone to school away from our village and had different ideas than his father. This eldest son secretly taught me to speak French and to read and write a little. I think that everyone thought he was raping me, but he was teaching me.

Other slaves were afraid of liberty. They were afraid they wouldn't know where to go or what to do. But I always believed that I had to be free, and I think that helped me to escape.

I tried to escape about ten years ago. I didn't know how close I was to Senegal, so I walked for two days in the wrong direction. I was found and sent back, and punished. My wrists and ankles were bound, then I was tied to a date tree in the middle of the family compound, and left for a week. The head of the family cut my wrists with a razor, so that I bled terribly. I still have scars on my arms.

Finally I met a man in the market who told me that Senegal was just across the river. I decided I had to try again. I ran to the river, where a man with a small wooden boat agreed to take me to Senegal. There I made my way to a safe house run by a former slave from Mauritania. I stayed in Senegal for a few years, earning my keep by doing housework. But I never felt safe. Always I was afraid that the master of the family would pay people to find me and bring me back to his house.

When I got to the U.S., I worked braiding hair. The first time I was paid for work I had done, I cried. I had never seen a person paid for her work before in my life. It was a very good surprise.

One of the hardest things was leaving my children behind, but I knew I had to escape first. In the three years I have been here, I have been working to free my children. I paid people to find them and take them to Senegal, and now I am paying for my children to go to school. Every morning I get up early, and buy a phone card, and speak with them. They tell me they would rather die in the street than return to Mauritania. My oldest daughter is now in the United States with me. I want very much that my other children will join us. In Mauritania, I never had the right to make decisions concerning my own children. Here, it is so different.

In Mauritania, I didn't dare go to the government, because they wouldn't listen. It doesn't matter what the laws say, because they don't apply the laws. Maybe it's written that there is no slavery, but it's not true. Even in front of the president of Mauritania I can say in full voice that there is slavery in Mauritania, because now I am as free as he is.

When I first came to the U.S., I was afraid that I would be sent back. But then I met my lawyer, and a doctor who helped me, and Kevin Bales of Free the Slaves, and the Bellevue Program for Survivors of Torture. The judge at my asylum hearing was honest, and did his job. He demanded proof, but then he listened, and paid attention.

I would like to be a citizen of the United States one day, and I want my children to be citizens. Here I have freedom of expression. In Mauritania, there was no freedom of expression. In Senegal, I was afraid to speak out, because we were so close to Mauritania. Then I had to be cautious. I had to be far, far, far away. Here, now, I can speak out.

Breaking the Chains

Estimated annual contribution by slaves to the global economy: 13 billion dollars

Some commercial production that involves slave labor:

- In Brazil slaves make charcoal used to manufacture steel for automobiles and other machinery.
- In Myanmar slaves harvest sugarcane and other agricultural products.
- In China child slaves manufacture fireworks.
- In Sierra Leone slaves mine diamonds.
- In Benin and Egypt they produce cotton. (A 1999 Egyptian government report estimated that one million children are forced to work in that country's cotton sector "because they are cheaper and more obedient [than adults], and are the appropriate height to inspect cotton plants.")
- In Ivory Coast some 12,000 child slaves pick cacao beans exported for use in chocolate. Slave labor has also been reported in the production of coffee, tea, and tobacco crops worldwide.



After work in tomato fields and citrus groves, farmworkers gather to tackle another job: ending labor abuses in South Florida agriculture. The Coalition of Immokalee Workers (CIW), mostly immigrants from Mexico, Guatemala, and Haiti, has rescued many of its own 2,000-plus members from five large-scale Florida slave-labor operations in the past six years. CIW estimates that up to 10 percent of U.S. farm laborers are enslaved. The rest are earning sweatshop wages. A March hunger strike at the California headquarters of Taco Bell (right) promoted awareness of farm-labor issues. "A penny more per taco could translate into twice what pickers now earn for tomatoes," says CIW member Lucas Benitez (above at left). With the small increase in cost for the consumer, large companies like Taco Bell might pay more for produce, and produce suppliers might be less tempted to slash labor costs by using slaves.





One U.S. shelter has rescued 10,000 **child prostitutes**

Sociologist Lois Lee, right, has spent 24 years working with children from 11 to 17 years old who've been trafficked by pimps. One young resident, left, at her Children of the Night shelter in southern California was forced to work as a prostitute in Oregon, Washington, Idaho, and Nevada before escaping her captor. "The sexual exploitation of American children cuts across every economic, ethnic, and social line," Lee says. "This is not just a Third World problem."



(Continued from page 18) town right beside a Ramada Inn. On the other side of the compound a gated community, Lakefront Estates, offered a restful environment for seniors.

"The slaves in Lake Placid were invisible, part of our economy that exists in a parallel universe," points out Laura Germino of the CIW. "People were playing golf at the retirement community, and right behind them was a slave camp. Two worlds, speaking different languages."

The Ramos case was in fact the fifth case of agricultural slavery exposed in Florida in the past six years. All came to light thanks to the CIW, which is currently promoting a boycott of fast-food giant Taco Bell on behalf of tomato pickers. The corporation boasts of its efforts to protect animal welfare in its suppliers' operations. Corporate officials also say they demand compliance with labor laws, but point out that since they cannot monitor suppliers' labor practices continually they rely on law enforcement to ensure compliance.

Slavery and slave trafficking in the U.S. today extend far beyond farm country into almost every area of the economy where cheap labor is at a premium. In 1995 more than 70 Thai women were rescued after laboring for years behind barbed wire in the Los Angeles suburb of El Monte, making clothes for major retailers while federal and state law enforcement repeatedly failed to obtain a proper warrant to search the premises. In June 2001 federal agents in Yakima, Washington, arrested the owners of an ice-cream vending company and charged them with using Mexican slaves, working to pay off transportation debts, to sell ice cream on city streets. According to Kevin Bales, there are between 100,000 and 150,000 slaves in the U.S. today.

The Department of State puts the number of people trafficked into the U.S. every year at close to 20,000. Many end up as prostitutes or farm laborers. Some work in nursing homes. Others suffer their servitude alone, domestic slaves confined to private homes.

The passage by Congress in 2000 of the Victims of Trafficking and Violence Protection Act, which protects such slaves against deportation if they testify against their former owners, perhaps has helped dispel some fearfulness. The growth of organizations ready to give help, like the CIW or the Coalition to Abolish Slavery and Trafficking, a southern California group that has

assisted more than 200 trafficked people, means that victims are not alone. Public scrutiny in general is rising.

Still, such captives the world over are mostly helpless. They are threatened; they live in fear of deportation; they are cut off from any source of advice or support because they cannot communicate with the outside world. And the harsh fact remains that this parallel universe, as Laura Germino called it, can be a very profitable place to do business. Before sentencing the Ramoses, U.S. District Court Judge K. Michael Moore ordered the confiscation of three million dollars the brothers had earned from their operation, as well as extensive real estate and other property.

Moore also pointed a finger at the agribusiness corporations that hired the Ramoses' picking crews. "It seems," he said, "that there are others at another level in this system of fruit picking—at a higher level—that to some extent are complicit in one way or another in how these activities occur."

A former slave named Julia Gabriel, now a landscape gardener in Florida and a member of CIW, remembers her arrival in the U.S. from Guatemala at the age of 19. She picked cucumbers under armed guard in South Carolina for 12 to 14 hours a day; she saw fellow captives pistol-whipped into unconsciousness. "Maybe this is normal in the U.S.," she thought. Then a friend told her, "no, this is not normal here," so Gabriel found the courage to escape.

"This is meant to be the country to which people come fleeing servitude, not to be cast into servitude when they are here," says Attorney General John Ashcroft. But some historians argue that the infamous trans-Atlantic slave trade that shipped millions of Africans to the New World was abolished only when it had outlived its economic usefulness. Now slave traders from Sherwood Castle to sunny Florida—and at hundreds of points in between—have rediscovered the profitability of buying and selling human beings. Which means that, in the 21st century, slavery is far from gone. □

WEBSITE EXCLUSIVE

- Read the latest U.S. Department of State report on trafficking.
 - Use an interactive map to track slavery worldwide.
 - Learn from expert Kevin Bales how you can help, and link to organizations working to stop slavery.
- nationalgeographic.com/ngm/0309.





"I have to believe that **this can change**"

So says social worker Marisa Ugarte. She speaks quietly of three boys living in a Mexico shelter, one 12 years old, the other two no more than 15. All had been shuttled between Tijuana and San Diego, California, and prostituted to pedophiles. Ugarte directs the Bilateral Safety Corridor Coalition, a network of 62 U.S. and Mexican organizations fighting trafficking. "People are beginning to see," Ugarte says, "that slavery is still real."

By Lynne Warren
Photographs by Jodi Cobb

Both National Geographic Staff

It's hard to believe that slavery still exists. It may be harder still to accept that hundreds of millions of people face lives only a little more free, with only a few more choices.

The poor and powerless often find themselves sacrificing their dignity, their children, even their own bodies, piece by piece, to a global market with an appetite for

INHUMAN PROFIT





This baby is not a slave. But with a tattered cardboard box for a cradle and a corrugated metal shack for a family home, this boy in Guatemala City starts life facing tough odds. He could be stolen or sold, then adopted illegally—part of an international process that has become a lucrative business for some Guatemalan

attorneys acting as middlemen.

Or he might grow up as one of the 44 percent of Guatemalan children who are chronically malnourished; one of the 80 percent who live in households without toilets or means of removing garbage; one of the 40 percent who face adulthood unable to read or write.

The poverty that afflicts the

majority of Guatemala's families is an example, not an exception. Three billion people—nearly half the world's population—struggle to live on less than two dollars a day.

Dire need may lead the impoverished to sell all or part of their only assets: their healthy bodies or those of their children. Tens of thousands of

Three billion people—nearly half the world's population—struggle to live on less than two dollars a day.



women and girls in developing countries become commodities in the highly profitable international sex trade. Other young women, because of traditional practices in their communities, are denied the right to make basic life choices about marriage and childbearing.

Though forced marriage has been denounced as a form of

slavery by the United Nations, and though virtually all countries have established legal minimum ages for marriage, local customs continue in defiance of the law. In the village of Bembe, in the West African nation of Benin, women and children gather before their chief (above). "Few of the girls in the village will reach 18

before they're married," says Hector Gnonlonfin, founder of Tomorrow Children, a shelter for exploited children. "We found a ten-year-old schoolgirl here who already had a husband."

The bride-price paid to parents by an older groom may spell the difference between starvation and survival for the bride's family. The consequences of



early marriage for a girl's health, however, can be debilitating, or even fatal. According to the World Health Organization, girls under 15 are five times as likely to die from complications of pregnancy than women in their 20s.

Sometimes physical sacrifice comes in a single act. These women in the southern Indian

town of Villivakkam, nicknamed "kidney village," each traded a kidney for cash (above). In their 20s at the time, married, and eager to pay off crushing family debts, they were easy marks for transplant agents who promised 50,000 rupees—about a thousand dollars—for an organ. The women got half the money in advance, but after their kidneys

were removed, the rest of the fees were never paid. India has outlawed commerce in human organs, though that has not stopped the trade.

Suffering has continued for these women: Three were abandoned by their husbands, who regard them as damaged goods. All that remain with them, they say, are their scars. □

Splendor on the grass-
land, zebra mothers
and foals rush through
a pasture in Kenya on
an endless migration.



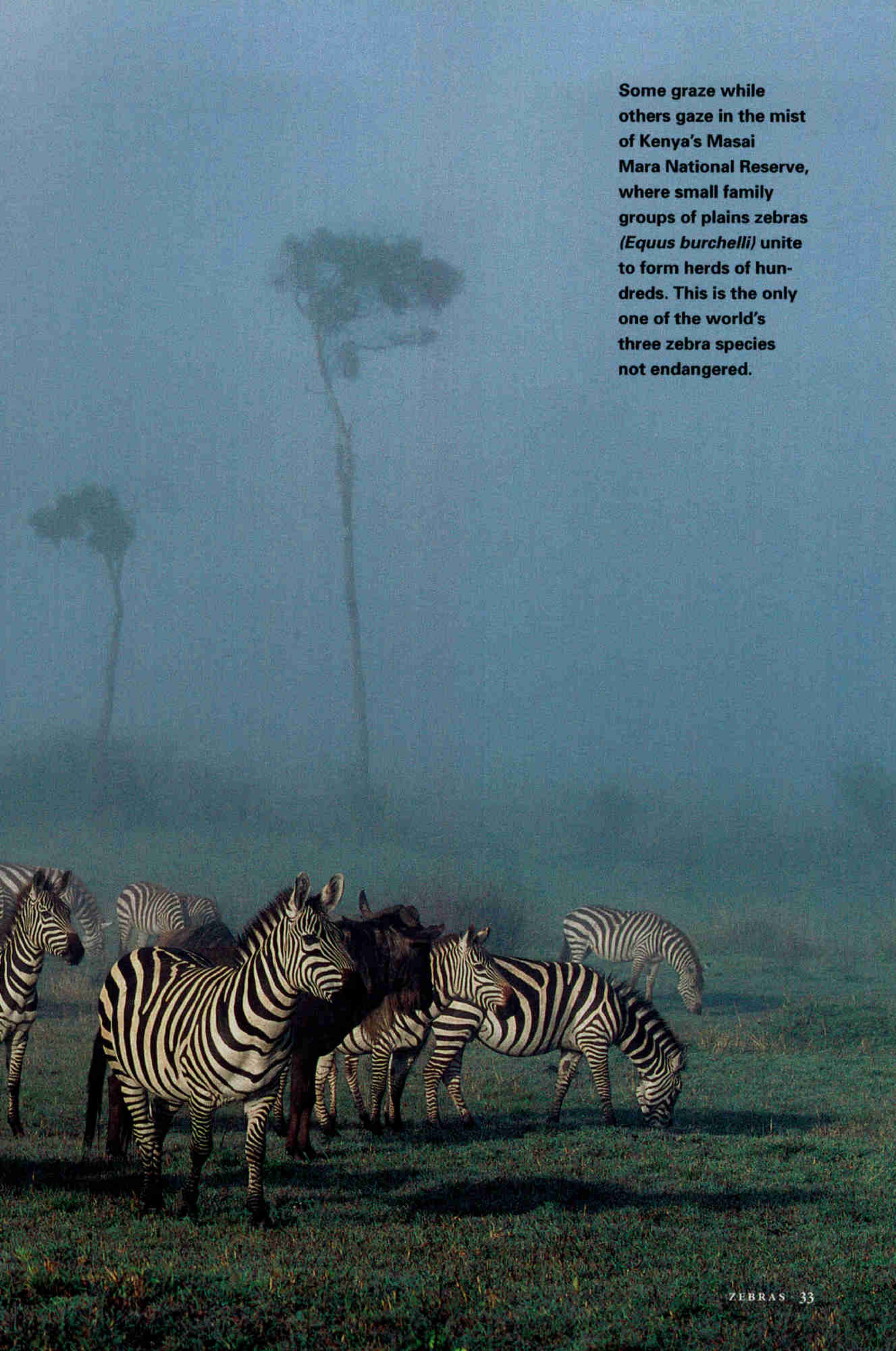
Z E B



R A S

BORN TO ROAM



A photograph of a herd of zebras in a savanna landscape. In the foreground, several zebras are visible, some standing and some grazing. The background is a misty, hazy landscape with several tall, thin acacia trees. The overall tone is soft and atmospheric.

Some graze while others gaze in the mist of Kenya's Masai Mara National Reserve, where small family groups of plains zebras (*Equus burchelli*) unite to form herds of hundreds. This is the only one of the world's three zebra species not endangered.

Stallions may go for the throat in battle but rarely do serious harm. Such fights often ensue when a rival tries to filch a filly from another male's family. A stallion reigns over a group of up to ten females and offspring.





BY JENNIFER STEINBERG HOLLAND

NATIONAL GEOGRAPHIC WRITER

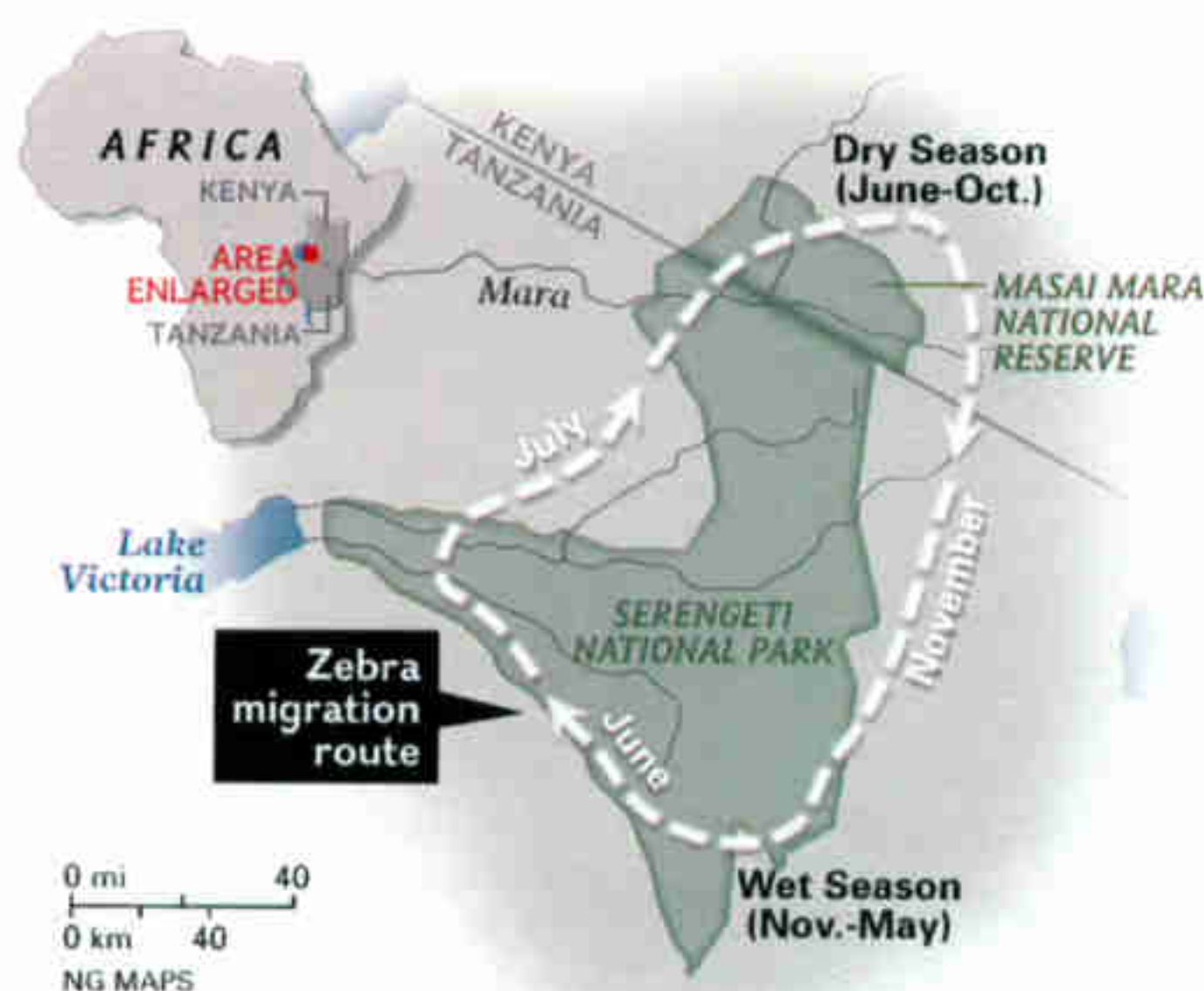
PHOTOGRAPHS BY ANUP AND MANOJ SHAH

MOTIF

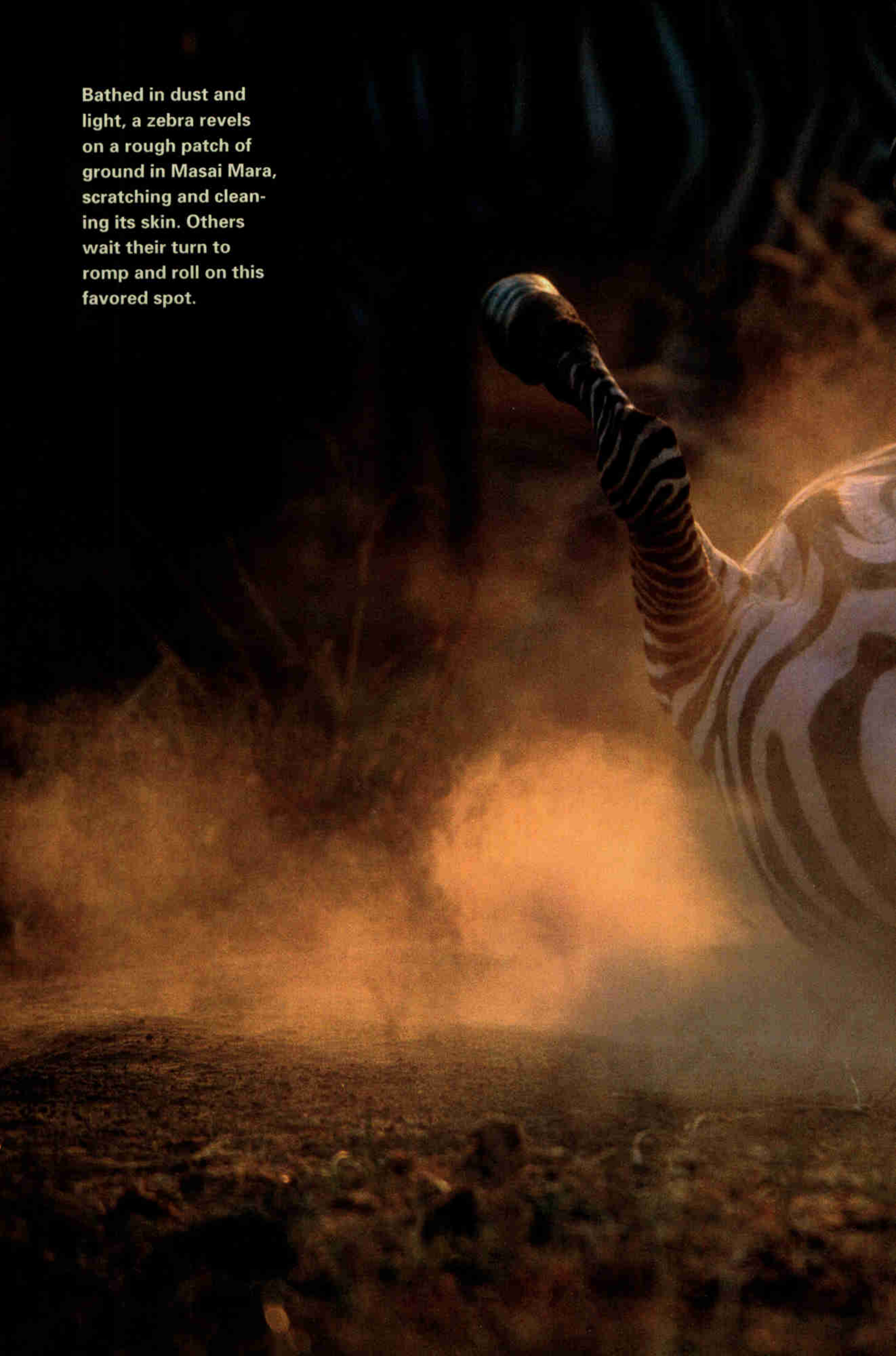




Perhaps it was a playful doodle by the Designer of Wild Things that led to the zebra: a horse in costume (candy wrapper? prison garb?) animating Africa's vast stage. Why the dizzying stripes, with no two coats quite the same? No one's sure, but the pattern may repel insects or distort the animal's outline in dim light, confusing predators. Celebrated for their epic migration of more than 300 miles, some 200,000 plains zebras follow the rain, sweeping clockwise (map) through Tanzania into lush Kenya in the dry season, then south again to foal on the storm-soaked Serengeti Plain. Anup Shah and his brother, Manoj, spent a year photographing these flamboyant cousins to the horse, finding a visual feast in the animals' giant herds (above) and athletic strides (left). "With zebras," says Anup, "you just point the camera at the fantastic view."



Bathed in dust and light, a zebra revels on a rough patch of ground in Masai Mara, scratching and cleaning its skin. Others wait their turn to romp and roll on this favored spot.

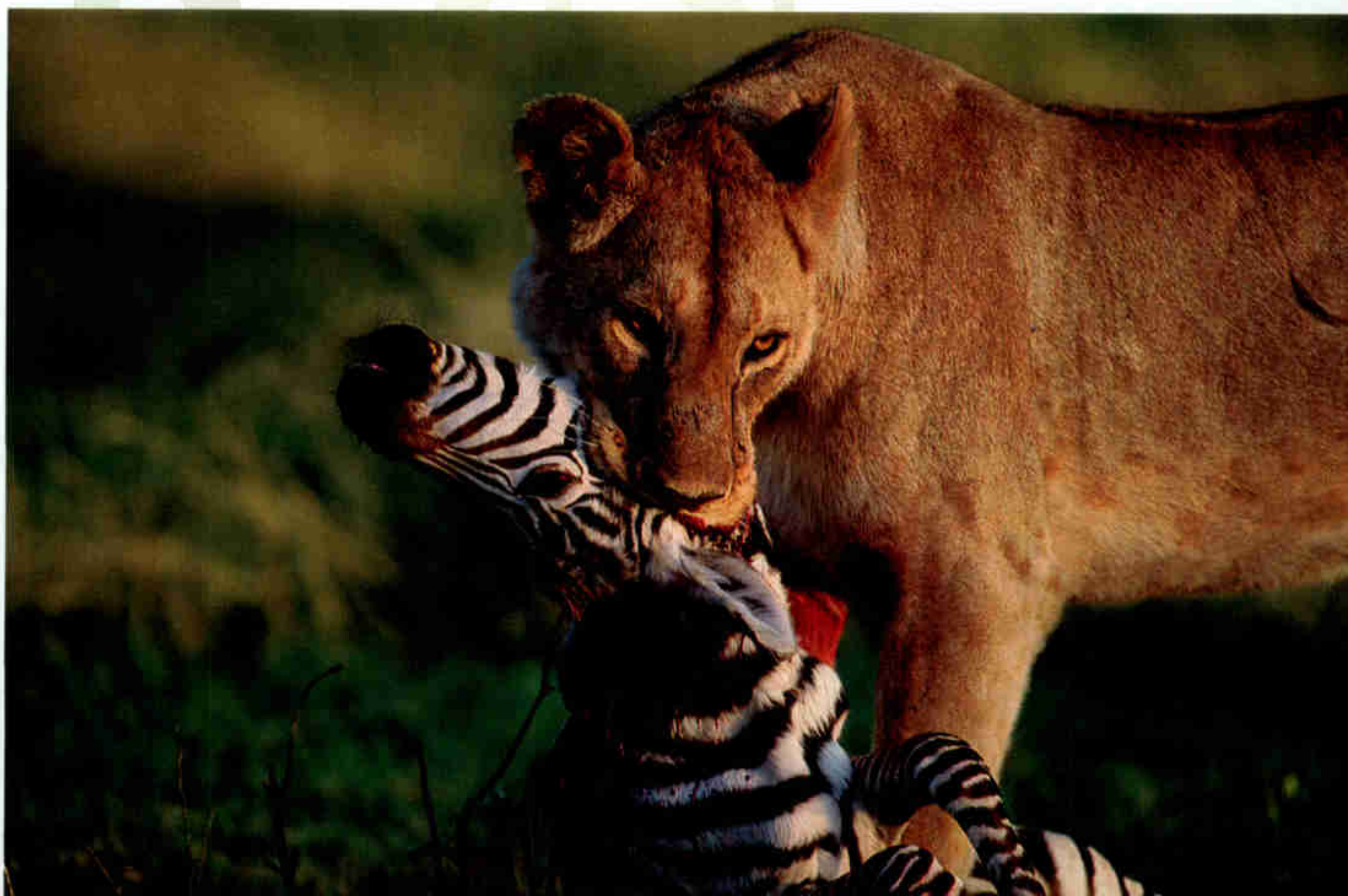






PREDATOR

Near Serengeti's southern edge a lioness eyed grazing zebras for half an hour, weighing her chances of taking one down alone. With cat stealth, chest low, she slunk closer, ignoring nearby wildebeests and watchful gazelles. Suddenly she burst into a run (above) and leaped toward her prey. As startled animals scattered in panic, claws tore into the victim's rump; it stumbled and fell. In Masai Mara another lone lioness prevailed (right), catching a herd off guard to snatch a foal from its midst. Hyenas and wild dogs also have a taste for zebra. Says Anup, "The drama of life and death keeps us coming back."



Green grasses beckon from the far side of the Mara River in Kenya, enticing zebras to try a treacherous crossing. As they pile in and plow ahead (below), crocodiles lurk mid-stream, hoping for a kill. On dry land zebras mingle with like-minded masses—well over a million wildebeests (right) and gazelles—sharing pastures but grazing on different plant parts, minimizing competition. With Serengeti rain zebras pause to foal, and new life rises on wobbly legs, soon ready to roam. □

WEBSITE EXCLUSIVE

Hear photographer Anup Shah's behind-the-scenes descriptions of his images at nationalgeographic.com/ngm/0309.





NATIONAL
GEOGRAPHIC
RESEARCH AND
EXPLORATION

FIELD DISPATCH PERU



FIELD SUPERVISOR

Mercedes Delgado
Archaeologist
Cerrillos, Peru

"It was a privilege to find her. I feel responsible for her preservation, to be able to learn everything about her without causing damage, to protect her."

GRANTEE

Dwight Wallace

Shaman or Sacrifice?

Archaeologists confront the mystery of a one-of-a-kind Peruvian mummy bundle and the enigmatic woman hidden inside.



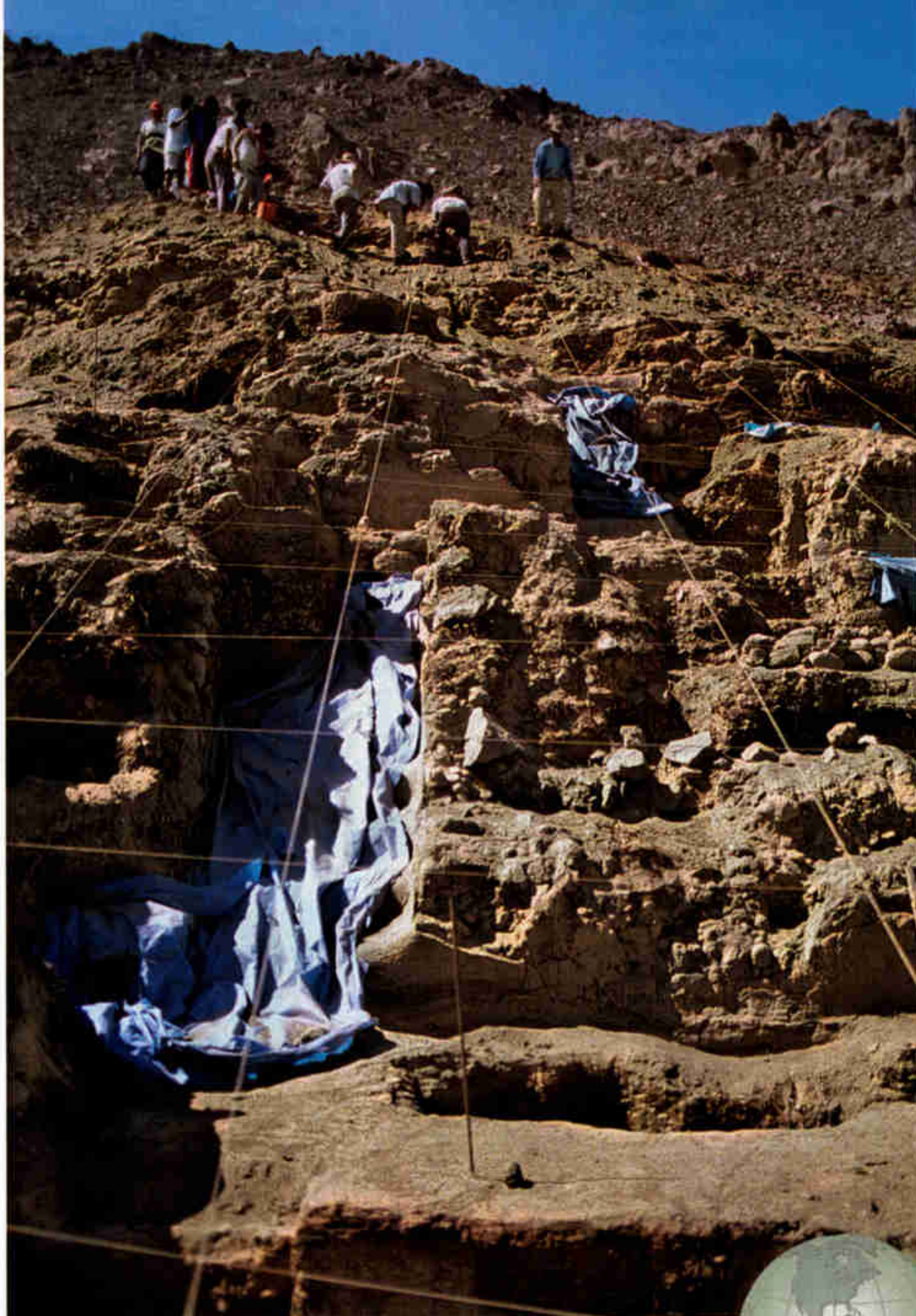
Plucked from brilliantly colored macaws, some 15,000 feathers adorn the front of a 1,300-year-old mummy bundle unearthed in Peru. The feathered mantle (above) topped by a beaked mask with a red crest and two blue "wings" formed the human-size figure of a bird. Inside lay the bones of a young woman who may have been a sacred healer—and perhaps was put to death.

By Karen E. Lange
NATIONAL GEOGRAPHIC WRITER

Photographs by Ira Block

She was 25 to 30 years old, possibly a mother, and buried like no one else of her place and time—Peru's arid coast some 13 centuries ago.

Last year, astonished excavators found her elaborate *fardo*, or mummy bundle, at Cerrillos, a religious center of the Paracas culture, which predates the Inca by 1,400 years. Until this find, the field team working with Mercedes Delgado and under NGS grantee Dwight Wallace (who discovered the site in 1958 and still oversees it) had been turning up mainly pottery sherds and textile fragments in the ruins of a terraced pyramid. But as the 2002 season ended, excavators clearing dirt near the top of the structure unearthed an unusual feathered textile unlike any known from the Paracas period. It formed two wings flanking a mask, below which lay what looked like the body of a huge bird. X-rays showed that the bundle held the bones of a woman.



DWIGHT WALLACE

Another surprise lay in store. The bundle dated from a time nearly 900 years *after* Cerrillos had been abandoned, suggesting that the burial was carried out by people of the much later Nasca culture, whose villages surrounded the ancient site.



THE PROJECT

SITE: Cerrillos, Peru
LOCATION: 180 miles south of Lima
OCCUPIED: circa 800-200 B.C.
(Paracas period)
AGE OF MUMMY BUNDLE: A.D. 675
(Nasca period)
HEIGHT: Five feet five inches
WEIGHT: 200 pounds
SIMILAR FINDS: None

In the ground (left) the mummy bundle stood propped up, as it might have been carried in a procession long ago. Fearing looters at the site—which was laced with a rope grid to aid documentation—archaeologists enlisted local volunteers (above) to help haul the find from its burial place to a museum in nearby Ica. There the plant-filled bundle (right) was opened to reveal a woman's cloth-wrapped skeleton.



MERCEDES DELGADO





“Practically everything about this burial is unusual. It is a total surprise.”

ARCHAEOLOGIST DWIGHT WALLACE



Wallace and Delgado are struggling to understand the find. “We have absolutely nothing like this,” says Wallace.

The burial—done in two stages—defied custom. Instead of dressing the young woman in her best clothes and letting the air naturally mummify her remains, those who prepared her body removed its clothes, bent it into a fetal position, wrapped it in plain cloth, and staked it outside. Beetles ate the flesh from her bones. Her skeleton was later wrapped in more cloth, surrounded by armfuls of plants—grasses, herbs, maize, peanuts, gourds, cotton, beans,

coca—and sewed into a bundle. Carried to Cerrillos, presumably a sacred ancestral site, the bundle was buried standing up and facing south. Inside, the young woman’s skull had been turned to look east toward the sun, “giving her the chance for rebirth,” says Delgado.

Wallace feels that the parrot-like fardo was displayed before burial as an idol—a “feathered sky goddess”—and that the skeleton and plants were meant

as offerings. But who was the woman and how did she die? Workers at Cerrillos dubbed the bundle the winged *shamana*, or female healer, a title the contents seem to suggest. Given the elaborate burial, she was obviously a person of status. Yet she was buried without riches or any possessions save a headband. “She wasn’t wealthy but was important,” says Delgado, “so special she was buried in a magical place.”

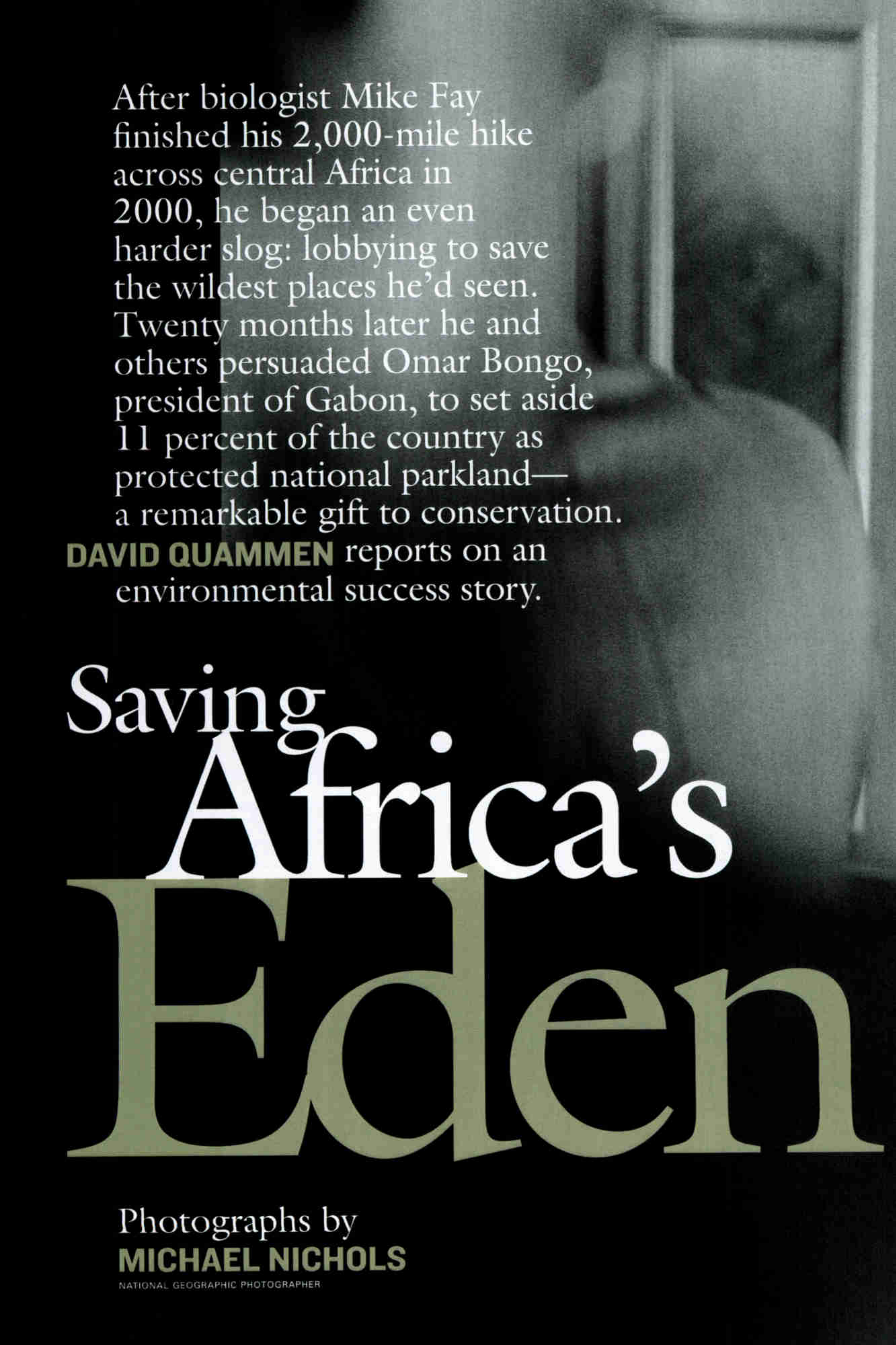
Delgado believes the woman may have been sacrificed, as was common in ancient Andean cultures. Yet the bones show no evidence of a ritual killing. Wallace thinks it more likely she died in an accident, perhaps a drowning, which would have left no mark and prevented mummification. The very uniqueness of her burial makes it impossible to explain—for now. □

WEBSITE EXCLUSIVE

Learn more about Peruvian mummy bundles from a listing of related websites and resources at nationalgeographic.com/ngm/0309.

To soften the shroud, researchers Bill Conklin (left, at left) and Jeffrey Splitstoser put the mummy bundle in a humidification chamber. Later, Delgado and Conklin unstitched the fabric (above). Conservators worked to preserve the blue cotton and red feather “tail” (right), an intricate display of ancient artistry.





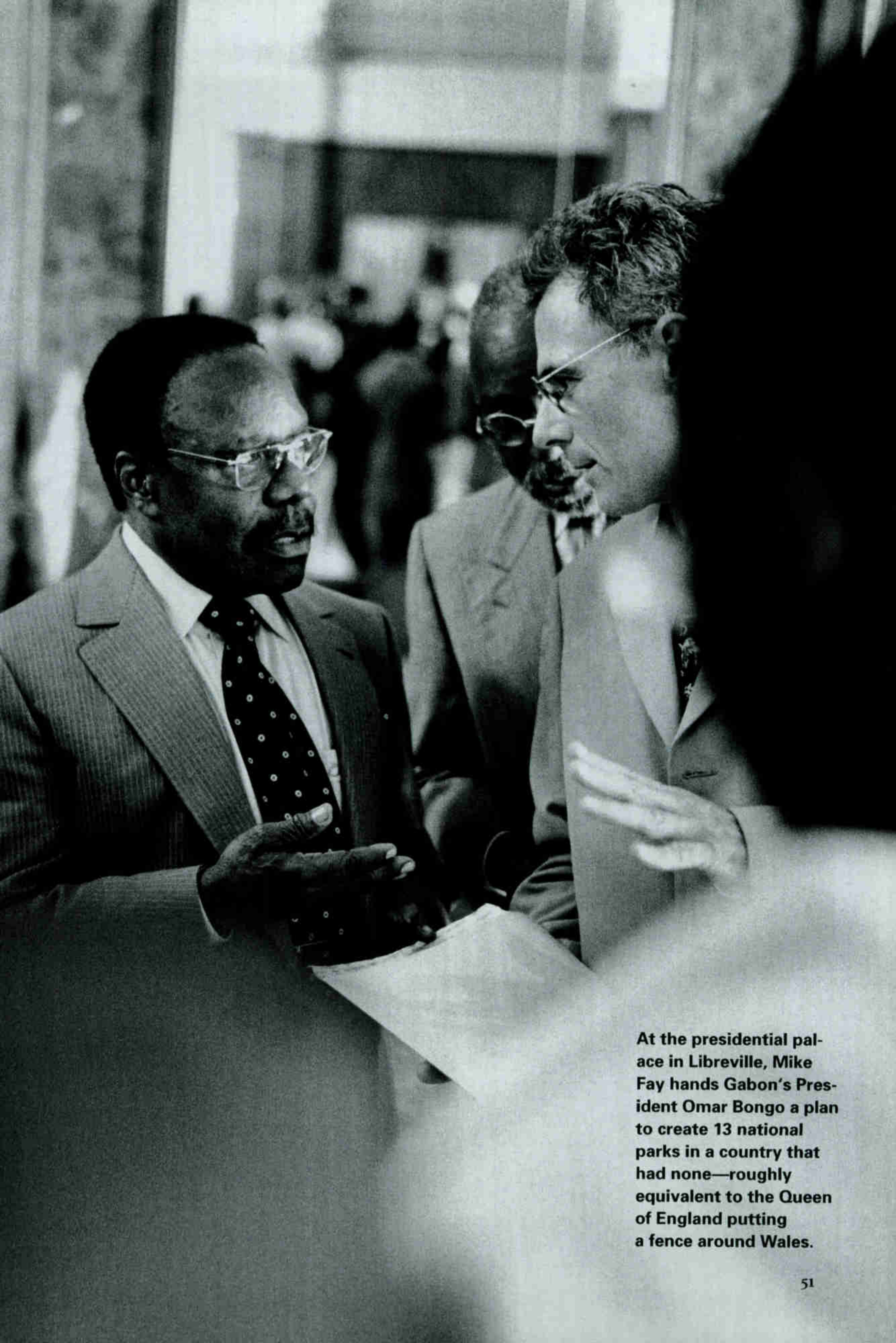
After biologist Mike Fay finished his 2,000-mile hike across central Africa in 2000, he began an even harder slog: lobbying to save the wildest places he'd seen. Twenty months later he and others persuaded Omar Bongo, president of Gabon, to set aside 11 percent of the country as protected national parkland—a remarkable gift to conservation.

DAVID QUAMMEN reports on an environmental success story.

Saving Africa's Eden

Photographs by
MICHAEL NICHOLS

NATIONAL GEOGRAPHIC PHOTOGRAPHER



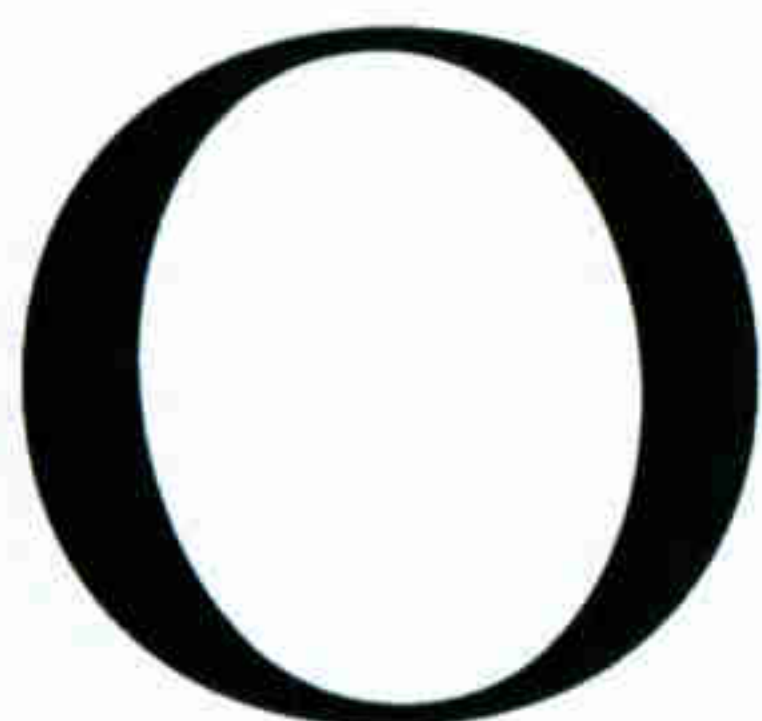
At the presidential palace in Libreville, Mike Fay hands Gabon's President Omar Bongo a plan to create 13 national parks in a country that had none—roughly equivalent to the Queen of England putting a fence around Wales.

A photograph of a female forest elephant standing at the edge of a watering hole. The elephant is partially visible on the right side of the frame, with its head and front legs in view. It is looking down at the water. The watering hole is in the foreground, reflecting the surrounding greenery. The background is a dense forest with tall trees and thick foliage. The ground around the watering hole is muddy and uneven.

Sniffing the air for danger, a female forest elephant follows her charges into Langoué Bai, a mineral-rich watering hole and wildlife magnet. Discovered by Fay, this site is now the centerpiece of Gabon's new Ivindo National Park.



GABON IS RICH IN EARTH'S RAREST COMMODITY— TROPICAL FORESTS LITTLE TOUCHED BY HUMANS.



On the morning of August 1, 2002, in Libreville, Gabon, President El Hadj Omar Bongo summoned his ministers to an urgent meeting. Almost no one except Mr. Bongo knew what was up. Did the government face some sudden financial crunch—related, maybe, to falling petroleum

revenues and rising deficits? Was there an international crisis, putting all Africa and the rest of the world on nervous alert? Had civil war broken out again somewhere in the region, central Africa, within which Omar Bongo in the course of his 35-year incumbency had earned a certain reputation as a peacemaker? Would the president undertake a mission of mediation? Even as his ministers gathered in the cabinet room of the presidential palace, they had no idea what the day's business would be.

Adding to their puzzlement was the fact that three outsiders had also turned up for the meeting—a British biologist named Lee White, employed by the Wildlife Conservation Society (WCS) of New York as head of its Gabon program; a Cameroonian biologist named Andre Kamdem Toham, based in Libreville for the World Wildlife Fund; and an American ecologist and explorer, J. Michael Fay, a WCS employee more familiar to some of those present as the “man who walked across Gabon.”* The minister of tourism turned to White, an acquaintance, and asked: “What are *you* doing here?”

The cabinet room is an impressive chamber, big as a tennis court, stately as a church, with two great mahogany tables running up the center. At the front is a raised presidential podium, like a postmodern, minimalist throne. Each of the tables is partitioned into ministerial cubicles equipped with telephones and other electronic communications gear. Large plasma

video screens face the tables for audiovisual briefings, with a separate screen positioned to serve the podium. The ministers took their assigned places. After a slight delay, while White and Fay struggled hastily to patch a laptop computer into the room's system, the president entered, a self-possessed man with a wide mustache and a warm smile, looking dapper in a bright yellow business suit. He said nothing. He sat down and, with a nod, signaled his minister of forest economy, Émile Doumba, to start the proceedings. Doumba announced simply that Dr. Fay and Dr. White would address the group on a matter of high interest to the president.

“And so I just launch into my dog and pony show,” Mike Fay said, recounting the scene during one of our quiet talks in Libreville months later, his wounds from a recent elephant goring now nearly healed, his zeal undampened by that near-death experience. “The president had a little TV screen in front of his face, and he's staring into it, you know, intently.” The ministers soon were engrossed too. Fay, better adapted to bushwhacking through swamps than to cabinet-level politicking, was wearing a jacket and tie borrowed that morning from Lee White's closet. He'd brought his laptop, as he carries it everywhere, stuffed into a day pack. The summons to

A rare clearing in a sea of forest, the mile-long Langoué Bai was carved out by elephants digging in the mud. Mike Fay calls it the most important discovery of his 2,000-mile Megatransect across central Africa.

*See the “Megatransect” series in the October 2000, March 2001, and August 2001 issues.



High Stakes

CHOOSING PARKS OVER TIMBER SALES IS A GIANT LEAP FOR A SMALL COUNTRY.



Biologist Lee White (left), co-author of the park plan, parachutes supplies to researchers at Langoué Bai—a three-day hike from the closest road. “The parks are intact, but logging pressure is building,” says White. “The next few years will be critical.” At stake are hidden wonders like the Ivindo River’s Mingouli Falls.

him and White had come on short notice, and the rushed distraction of solving the computer-compatibility problem had left him little time to gather his thoughts about what he would say. But, having delivered variants of the same spiel already to so many and such various audiences, he wasn't shy about winging it before a council of ministers.

Clicking through a series of striking photos (many of them shot by Michael “Nick” Nichols for the “Megatransect” series) in a PowerPoint presentation, Fay described the extraordinary biological riches residing in the trackless forests, the remote mountains, the inland and coastal waters of Gabon, and the extraordinary opportunity—an *economic* opportunity as well as a conservation opportunity, considering the potential earnings from ecotourism—that might be seized by protecting those riches within a network of national parks. Click: forest elephant, stern and alert. Click: humpback whale, breaching skyward like a frisky trout. Click: Gaboon viper, its big coppery head so close to the lens you could almost feel the flick of its tongue. Click: granite inselberg, like a great igneous gumdrop, protruding above forest canopy. Click:

bulge-eyed hippopotamus, almost unrecognizably strange and serene, riding a wave along the Atlantic coast. “Of course, everyone is blown away by the surfing hippo,” Fay told me. This is Gabon, he reminded the ministers. This is your country, like none other on Earth.

“And then Lee gets up,” Fay recounted. “He’s like the icing on the cake, because he’s got video.” White’s video collage depicted many of the same creatures and places, except that this time the elephants, the hippos, and the whales were in motion, flickering across the plasma screens that served as windows to Gabonese wonders lying not far beyond the walls of that room. From a clearing amid the vast east-central forest, a place known as Langoué Bai, undiscovered until Fay walked through it, there was a startlingly intimate sequence of a female gorilla as she suckled, kissed, and dandled her infant. From a faunal reserve called Lopé, just beyond the Chaillu Massif, came the sight of hundreds of mandrills (monkeys of the species *Mandrillus sphinx*) in full sprint across a savanna.

Some of his footage (notably the maternal gorilla scene, shot by a visiting activist named Sam LaBudde) was so affecting that White let



it roll silently, without commentary. By the time he finished, his presentation plus Fay's had taken more than an hour, and the captive-audience ministers, according to Fay, must have been wondering, Aren't these guys ever going to shut up?

Not quite yet. With the president's permission White launched into a coda, extolling the same grand idea mentioned by Fay: a network of national parks.

One by one he described them—13 magnificently wild areas, 13 prospective parks. They ranged from the seacoast at Gabon's southwestern extremity (Mayumba, a potential marine park) to the inselbergs of Minkébé in the country's northeastern corner. They included the fog-topped mountains northeast of Libreville (Monts de Cristal, with their inordinate botanical diversity) and the pristine forest surrounding Langoué Bai in the upper Ivindo River drainage, harboring big-tusked elephants and unwary gorillas, and gated by tall waterfalls on the Ivindo and several tributaries. It was a menu of options representing a wide variety of species-rich ecosystems, each area meriting consideration for national park status—someday,

perhaps. White could speak expertly about these areas, having directed a comprehensive evaluation of them (in collaboration with Andre Kamdem Toham and aided by various Gabonese partners) during the preceding two years, with the encouragement of Richard Onouviet, formerly the forestry minister, who now held another portfolio in the cabinet.

Concluding, White showed a map of Gabon. Outlined on it like giant amoebas were the 13 candidate areas. This is what we think you should do, he told the president and all the president's men. We respectfully recommend that, to conserve biological diversity and promote ecotourism in Gabon, you create such a network of national parks.

Truth be known, White and his colleagues were reaching for pie in the sky. A multiple-parks network was the long-term goal, and 13 components seemed the best-case result for the future. A more immediate objective, far less ambitious but still difficult enough, was to get park status for just the Lopé Reserve. Lopé was one of several Gabonese areas (Continued on page 62)

GABON'S GREEN GAMBLE



A country the size of Colorado, Gabon has some of the largest blocks of virgin forest in Africa. President Bongo hopes the 13 new parks, protecting 11,294 square miles, will make tourism a viable alternative to logging.

MONTS DE CRISTAL

The rugged cloud forests here may contain the greatest plant diversity in Africa's rain forests, including wild orchids.

AKANDA

Vast mangrove swamps and tidal flats attract the largest number of migratory birds in Gabon.

PONGARA

Gabon's most popular beach retreat features hotels, lodges—plus herds of elephants and forest buffalo.

WAKA

Mountains and ravines line the Ikoy rift valley, where early Gabonese cultures flourished. The park protects ancient village sites and a trove of plant species.

LOANGO

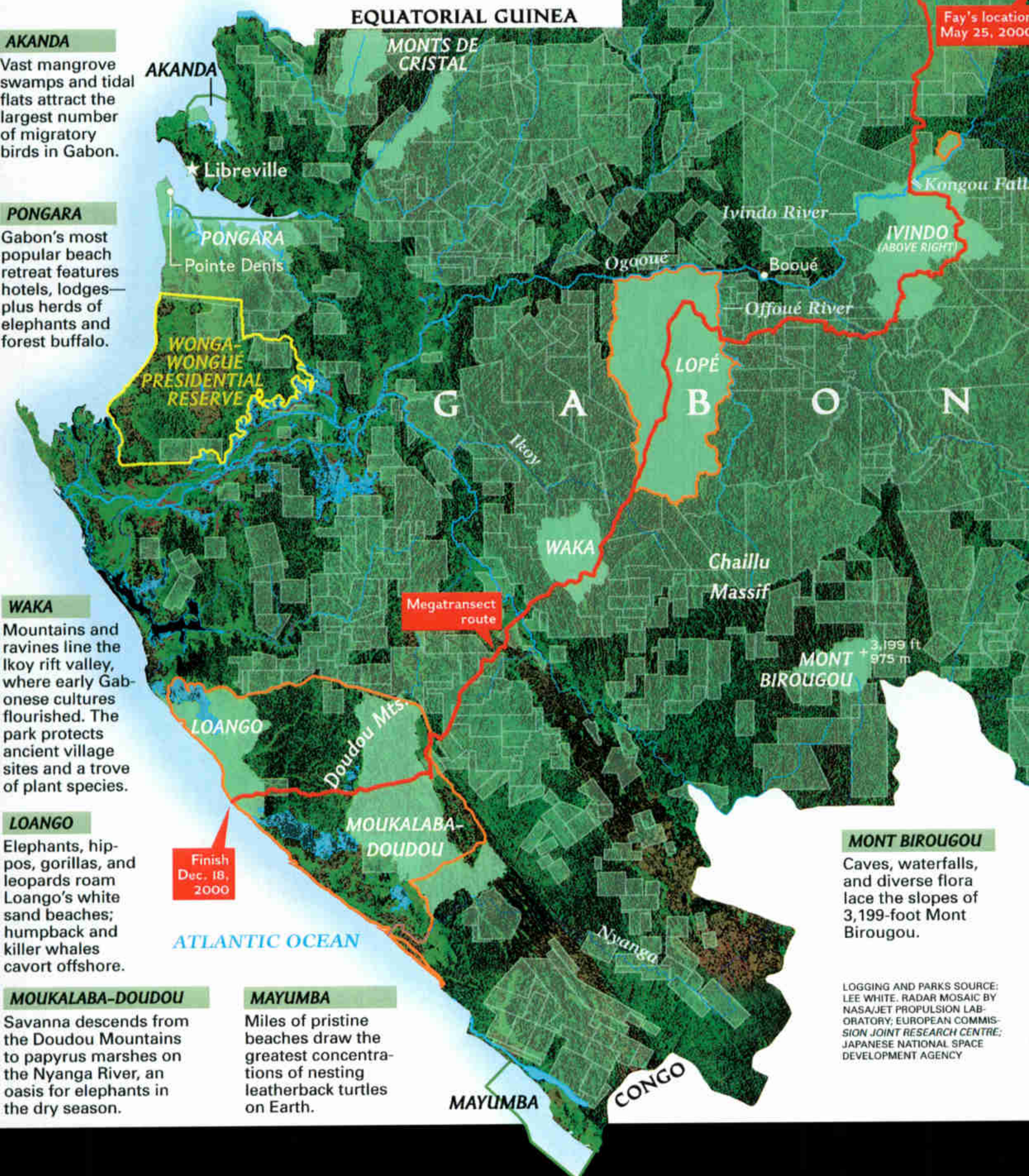
Elephants, hippos, gorillas, and leopards roam Loango's white sand beaches; humpback and killer whales cavort offshore.

MOUKALABA-DOUDOU

Savanna descends from the Doudou Mountains to papyrus marshes on the Nyanga River, an oasis for elephants in the dry season.

MAYUMBA

Miles of pristine beaches draw the greatest concentrations of nesting leatherback turtles on Earth.



MONT BIROUGOU

Caves, waterfalls, and diverse flora lace the slopes of 3,199-foot Mont Birougou.

LOGGING AND PARKS SOURCE: LEE WHITE. RADAR MOSAIC BY NASA/JET PROPULSION LABORATORY; EUROPEAN COMMISSION JOINT RESEARCH CENTRE; JAPANESE NATIONAL SPACE DEVELOPMENT AGENCY

MINKÉBÉ

Engulfed by one of the biggest wilderness areas in central Africa, Minkébé is renowned for its large granite domes known as inselbergs.

MWAGNE

Site of the biggest *bai*, or water hole clearing, in Gabon, Mwagne supports bongos, otters, and a large population of elephants.

IVINDO

Ivindo protects Langoué Bai and spectacular Kongou and Mingouli Falls on the Ivindo River.


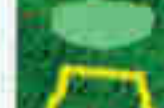


LOPÉ

Famous for gorillas, chimpanzees, and the largest mandrill troops in the world, Lopé also features ancient rock engravings.

PLATEAUX BATÉKÉ

Undulating savannas cut by crystal-line streams and ribbons of forest house a unique program to return orphan gorillas to the wild.

MAP KEY

-  Preexisting protected area
-  New national park
-  Other protected area
-  Logging concession

0 mi 50
0 km 50

NATIONAL GEOGRAPHIC MAPS

Gathering place for hundreds of forest elephants and primates that likely had never encountered humans, Langoué Bai was a natural place to name as part of Ivindo National Park—except that it was covered with logging concessions. Working closely with Gabonese officials and French timber giant Rougier, S.A., Fay and colleagues persuaded the company to give up its leases in the area in order to protect one of the most important wildlife habitats in Gabon.



Gabon is an African anomaly, a relatively prosperous, politically stable nation and the least densely populated country in central Africa. White sand beaches and mangrove swamps give way to a rugged, densely forested interior—some 75 percent of Gabon remains covered in forests, which are among the richest and most diverse on Earth—and an eastern fringe of grassy plain. Up to 20 percent of Gabon's plant species are found nowhere else. Timber exports drove the national economy until the 1970s, when large oil deposits were discovered offshore. Still, logging is the country's second largest source of revenue, employing more than a quarter of the workforce. Timber production soared during the 1990s, with half of Gabon's forest now leased to loggers. Environmental laws are rarely enforced, particularly those aimed at halting the bush-meat trade—said to be worth 50 million dollars annually—which often goes hand in hand with logging. Hunting and outbreaks of Ebola virus have cut gorilla and chimpanzee populations in half in Gabon and neighboring Congo since 1983, making the 13 new national parks more vital than ever.

Logging okoume trees—the backbone of Gabon’s rain forest and timber industry—was the greatest threat to areas now protected as parks. Cutting continues outside the parks, with most logs shipped to Asia and Europe.







that, as *réserves de faune*, already enjoyed some protection; but as a national park supported by full management and enforcement mechanisms, with no hunting allowed and no timber extraction, it would be something quite different. Lopé was especially close to White's heart because of his dozen years as a researcher there. With its mandrills, its elephants, its two decades of gorilla and chimpanzee studies, its mysterious archaeological sites suggesting a sizable human population that vanished some centuries ago, and its first-class hotel, it contained a wealth of attractions for Gabonese vacationers, international tourists, and scientists. If any of the 13 areas stood to become Gabon's first modern, genuinely protected national park, it was Lopé. In fact, White and his two colleagues in the cabinet room hoped that President Bongo might be ready—maybe that very day—to sign a decree establishing Lopé National Park.

No one had interrupted their pitch with so much as a question. Afterward, no one spoke. White, Fay, and Toham sat politely. "It was over," Fay recalled, "and the president was beckoning for something." Minister Doumba went to the podium with an elegant folder. Opening it, he

showed the president a document—the Lopé decree. The president browsed it, then shook his head. No, he murmured to Doumba. No, that's not what I want. He didn't address the full group, but obviously something wasn't right.

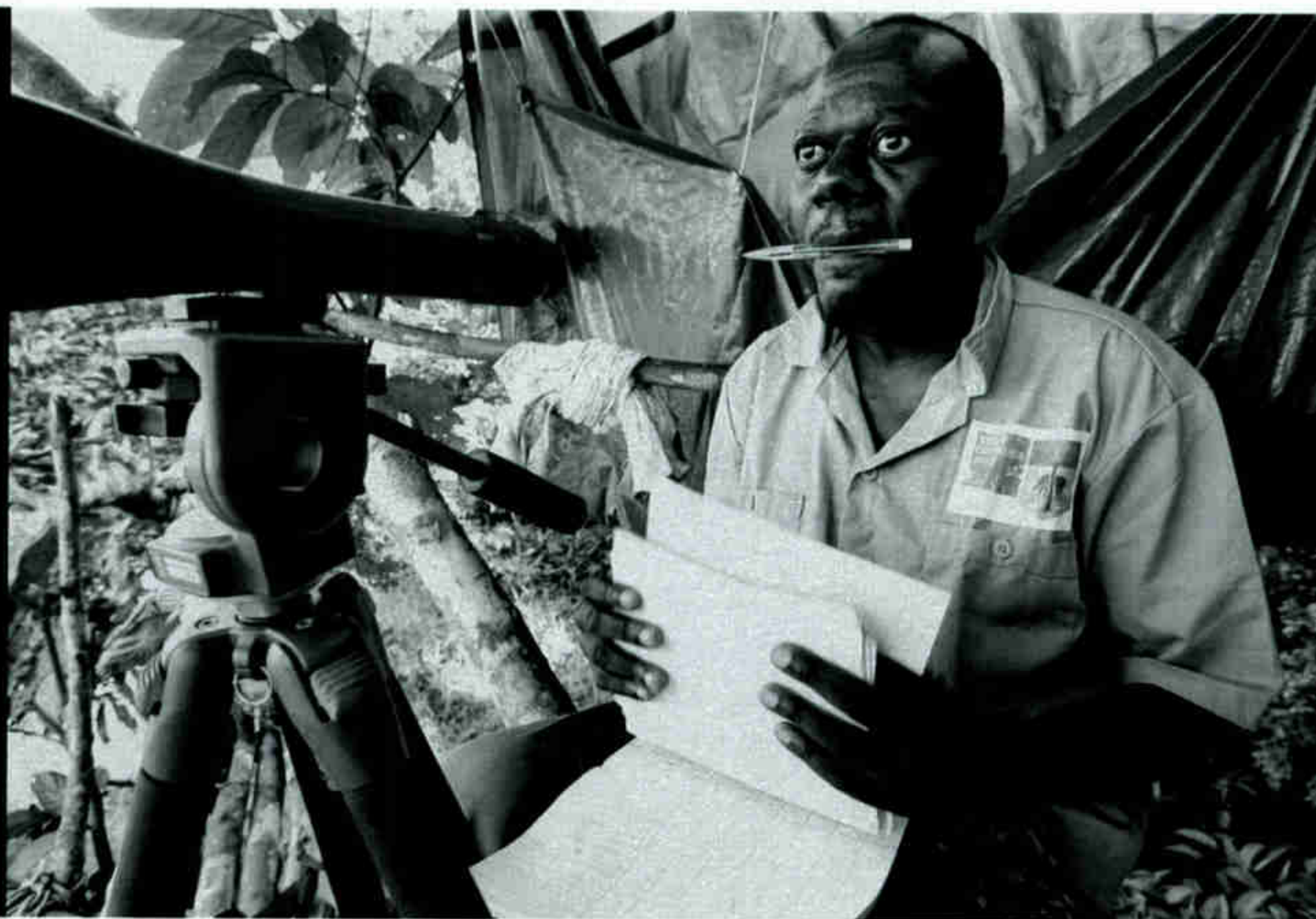
Confusion, consternation, embarrassment. Going to the aid of Doumba, Fay invited himself onto the presidential podium and glanced over the presidential shoulder. Yes sir, that's it, that's the Lopé decree, he affirmed. Fay could intervene so presumptuously because, based on a single previous meeting and on the media coverage of his Megatransect, President Bongo had taken a shine to him—the crazed American, the wild child who footed his way across all those nearly impassable forests and swamps, who sat half naked atop the inselbergs, who brought back photos and tales of a Gabon that Omar Bongo himself hadn't known existed. But even Fay couldn't appease Mr. Bongo at this moment.

Frustrated, the president spoke. *I want the whole thing*, he said. *Not just Lopé. I want the network.* Minister Doumba, poor man, was unprepared for this leap. What network? *I want the network they just described*, said the president. There is no verbatim transcript, but by all

Job Outlook

OMAR BONGO SEES A FUTURE
BASED ON ENJOYING, NOT EXPLOITING, NATURE.

While young male elephants spar in Langoué Bai, Gabonese researchers like Modeste Doukaga record the action, sketching each animal's distinctive ear for future identification. Conservationists say the parks will produce more jobs as tourism grows, giving the Gabonese a vested interest in park protection.



accounts he made himself clear. *I want 13 decrees establishing 13 new national parks. I meant to sign them today. Get on it.* And then, with a faint wave to Fay and White, barely a word to anyone else, President Bongo strolled out of the room.

The others remained, looking stunned and vaguely bewildered. "It was kind of an anticlimax," Fay told me later. "We thought, My God, what happened there?"

Elvis had left the building. The music had been transcendent, but there were no autographs.

On an afternoon in January of this year, near the start of the long rainy season, Lee White and I took off in a small plane from a grass airstrip in central Gabon and headed eastward, 600 feet above the treetops. Beneath us, in a paisley pattern of savanna clearings, strips of gallery forest along streams, and bosquets (patches of isolated forest), lay the area formerly known as Réserve de Okanda-Lopé. The verdant forest patches and strips were spackled with bright globes of sumac red, auburn, and bloodshot orange, indicating the scattered individuals of a single tree species, *Lophira alata*, collectively

marking the seasonal change with their rubicund new vegetation. It was a delicate spectacle, like the Smoky Mountains in early October when the maples have gone crimson but the buckeyes and oaks are still green. Yes, the *Lophira*, remarked White, they do seem uncommonly well synchronized this year. An intense man with an unassuming manner, laconic but not blasé, he sat at an open baggage hatch in the back of the plane, without a seat belt or harness, shooting video of the pretty trees.

We passed above the Offoué River, a modest squiggle of brown, near its confluence with the much larger Ogooué. The Ogooué, one of central Africa's great waterways, sharing a divide with the Congo River, oozed seaward from the Gabonese interior like an enormous runnel of gravy. The little Offoué serves as the east boundary, and the mighty Ogooué the north, of what is now Lopé National Park. The decree of establishment for Lopé, along with 12 other such decrees, was signed by President Bongo on August 30, 2002, less than a month after the cabinet-room meeting.

The ink is dry and the parks network is reality—at least on paper, as a matter of law.

Gene Pool

AWASH WITH LIFE, GABON HAS PLEDGED TO BECOME A LEADING STEWARD OF BIOLOGICAL DIVERSITY.



Perched on the edge of the Congo Basin, Gabon's forests support some of the greatest numbers of species on the continent. Ungulates like the sitatunga, a water-loving antelope (left), and the forest buffalo (right) have declined in many areas but gather at Langoué Bai for its rich grasses and cooling mud.

This 13-park initiative, which Mr. Bongo himself announced last September at the World Summit on Sustainable Development in Johannesburg, *potentially* (mark that word) constitutes one of the most significant conservation actions since March 1872, when another president, Ulysses S. Grant, signed a bill from the American Congress establishing Yellowstone National Park, the world's first. The Gabonese parks reflect a visionary decision grounded in economic pragmatism. After decades of heavy reliance on petroleum and timber industries, Mr. Bongo said, "we are left with little oil in the ground, a fragmented forest, dwindling income, and a burden of debt." The next growth sector of his nation's economy, he vowed, would be "one based on enjoying, not extracting, natural resources."

Whether or not the Gabonese enterprise achieves that potential will depend on the rigor and sagacity of the follow-through. And the follow-through will depend partly on the strength of international assistance. In that arena, early signs are hopeful. During the same week as Mr. Bongo's announcement, U.S. Secretary of State Colin Powell also visited the Johannesburg summit and made a complementary declaration:

The United States intends to contribute 53 million dollars within a four-year period to a collaborative effort called the Congo Basin Forest Partnership, in support of natural resource management in six countries of the central African region. A healthy share of the American money will likely go to Gabon. With additional help from other developed nations (including France, Germany, and Japan), and from some nongovernmental organizations (notably the Wildlife Conservation Society, Conservation International, and the World Wildlife Fund), Gabon should be able to create the training programs, the infrastructure developments, the management and enforcement regimes necessary to make the parks gambit a tangible success, both in economic terms (through ecotourism) and for conservation. If that success does come, it will be huge.

Lopé National Park alone comprises 1,919 square miles of savanna and forest landscape, and the entire network totals 11,294 square miles, or 11 percent of the land surface of the country. Percentagewise this puts Gabon neck and neck with Costa Rica, whose national parks support a thriving ecotourism industry. But



Gabon is five times as large as Costa Rica, and its equatorial forests and wetlands are known to be teeming with life. The sheer sum of natural assets within its 13 new parks, including known species of high concern (such as the forest elephant, the western lowland gorilla, the dwarf crocodile, the chimpanzee) as well as animal and plant forms yet undiscovered, is incalculably large. With the president's decision last year, Gabon has pledged to become one of the world's leading stewards of biological diversity.

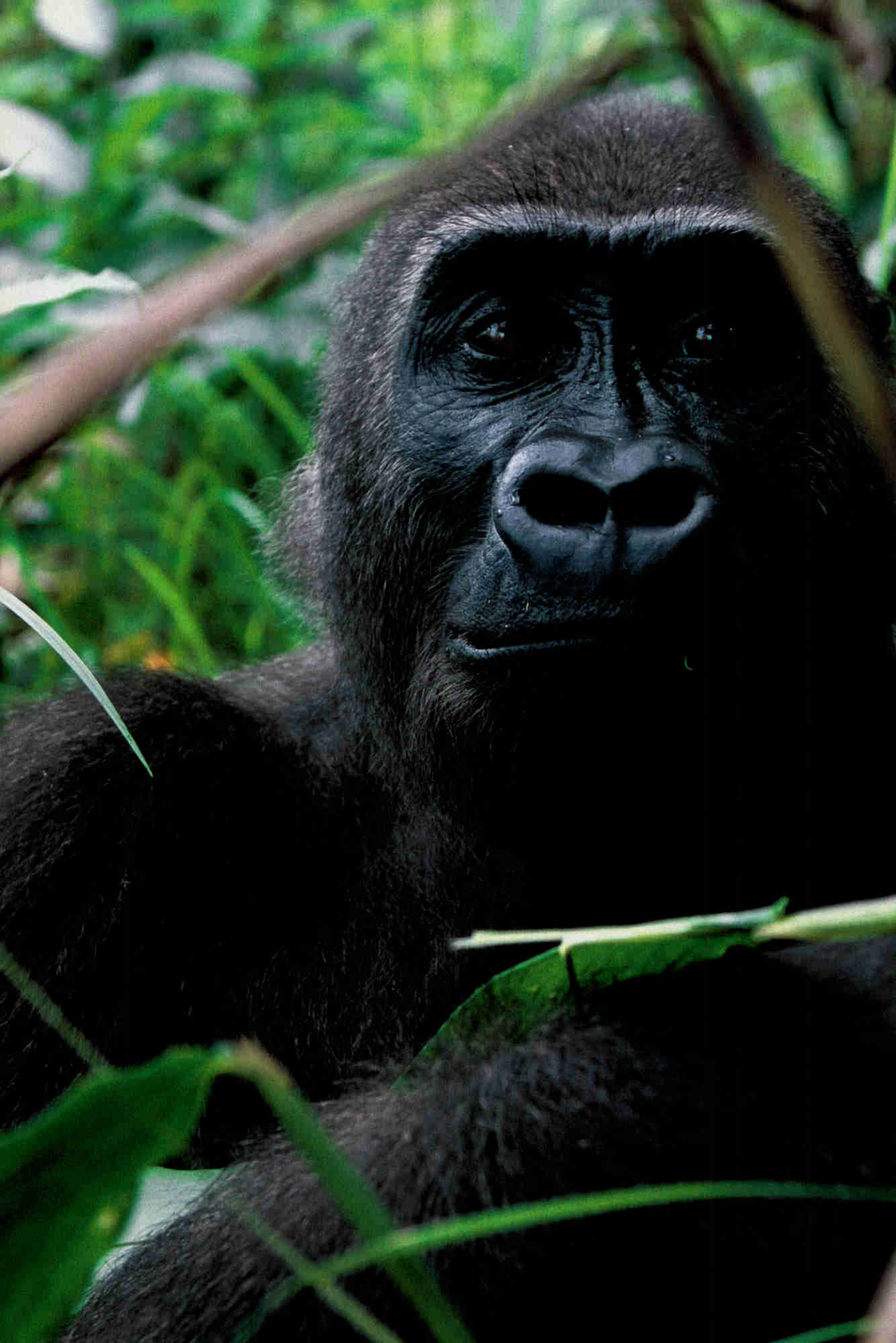
Lopé is a central piece of the parks network, not just geographically but also because of its well-established research station and its classy hotel. But our January reconnaissance flight took White and me eastward to another new park, Ivindo, one of the least known and most intriguing of the 13. Still at low elevation, we followed the Ogooué upstream into Gabon's deep interior, the river's riffles and small islands slipping behind us, its banks heavily forested except for the occasional glimpse of a railroad line or a tawny clay road.

Once we'd passed over the town of Booué,

with its airstrip and logging yard, we saw almost no signs of human presence. The Ivindo River, a major Ogooué tributary, was easy to recognize—a big blackwater channel pouring in from the north, dark with tannins leached from detrital mulch in the swamps and seasonally flooded forests that it drains. From overhead, as we crossed the mix zone of the waters, I noticed that the black disappears quickly into the brown, like some precious decoction of wildness diluted into a world of muddled striving and erosion. You can't bottle that stuff—another reason the world needs national parks. Blackwater without the natural sumps that generate it, the creatures that lurk in it, the time and repose necessary to distill it, is just cold tea.

Stay with the Ogooué, I told our pilot through the headphone radio. Twenty miles on we spotted what we were looking for: another blackwater river, smaller, this one known as the Djidji. We followed it upstream, the plane

**GABON'S FORESTS MAY
RIVAL SOUTH AMERICA'S
IN FLORA AND FAUNA.**





Once dressed in children's clothing by her owners, a seven-year-old gorilla is now flourishing in the forests of the new Plateaux Batéké National Park, thanks to a novel project to return such captive gorillas to the wild.



carving to and fro along a gently undulant approximation of the river's serpentine course. We gazed down at one set of minor chutes—a rocky cascade totaling 40 feet of vertical drop—and soon afterward passed the invisible boundary into Ivindo National Park.

The next set of chutes appeared major even from our vantage circling above it. Abruptly, from a lip of quiet water screened by trees, the Djidji River drops nearly 200 feet, its volume split into five fingers that clench down over the rocky face like a grasping hand, each finger a frothy channel punctuated by ledge holes and rooster tails, plummeting to an explosion of foam at the bottom. After three circuits we continued upstream, where the river's surface again was as sleek as an ebony table. The chutes seem to mark an escarpment of some sort, above which the Djidji winds sedately across a flat, thickly forested plateau. All we could see beneath us, around us, to the horizon in every direction, was unbroken canopy in its thousand shades of green and, through it, a thin slash of black.

Langoué Bai, the hidden clearing discovered by Fay, with its concentrations of elephants and gorillas, lay dozens of miles to the south. Lee

White himself had led the field team that hiked to that bai, after Fay had put it on the map, and established a continuous monitoring effort. But the approach to Langoué, via an old road and then three days of hard bushwhacking, is from another direction. White hadn't visited these mysterious precincts of the upper Djidji—flown over them, yes, but never gotten on the ground—and he shared my curiosity about what's down there. Early observations at Langoué, he told me, suggest that the elephants drawn to the bai (for succulent vegetation, water, salt, or whatever) make some sort of seasonal migration away. They disappear when the rains end. Where have they gone? Our guess, he said, is that they come here during dry season to the marshy, provident flatlands of the upper Djidji. It might be the last unprobed hideout of Gabon's biggest tuskers.

But no one knows that for fact. The work of data gathering at Langoué Bai has barely begun, and the exploration of the surrounding watersheds, including the Djidji River above the chutes, is another urgently tantalizing task on a list of many. Ivindo National Park, like some of the others, is still a black box of uninventoried treasures.

Safe Haven

PARK STATUS TURNS A LOCAL PROBLEM—POACHING—INTO A NATIONAL PROBLEM.

Hunters killed their parents for meat; now orphan gorillas relearn forest survival skills with help from Liz Pearson (right) of the Gorilla Protection Project in Plateaux Batéké National Park. As their surrogate mom, Pearson points out edible shrubs and provides emotional support until the apes can make it on their own.

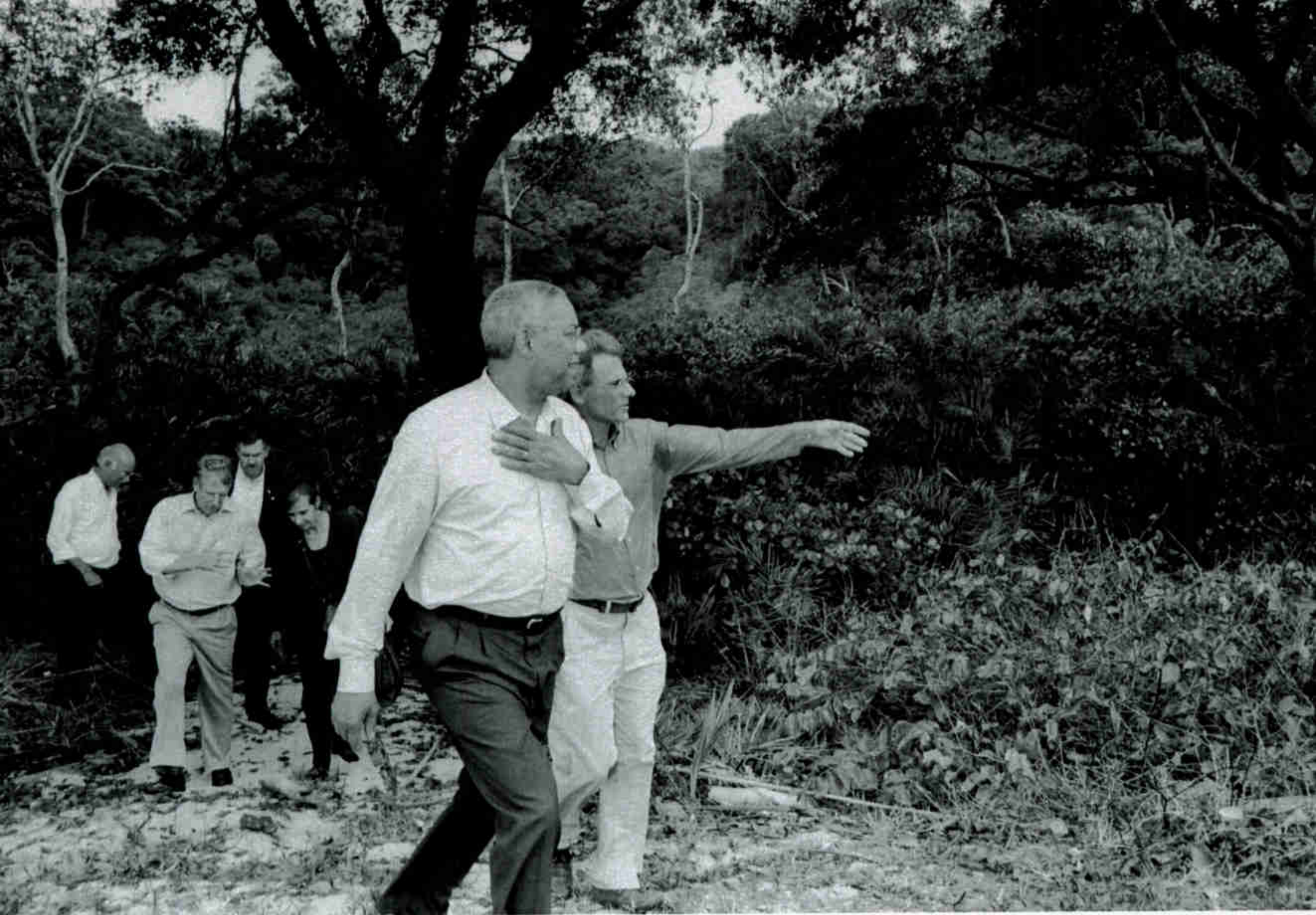


The Gabon parks story, like the chutes of the Djidji, entails a number of split but converging branches. Some of them have meandered through channels far from Libreville. Months before Omar Bongo's surprise announcement, a diverse cast of players was performing its varied roles in a complicated narrative, with scenes and subplots set in Washington, Paris, and elsewhere, all leading toward a two-tiered result: Gabon's bold initiative and, as its wider context, the Congo Basin Forest Partnership.

The Washington subplot included a significant moment in the early days of George W. Bush's presidency when, on June 4, 2001, Walter H. Kansteiner III was sworn in as assistant secretary of state for African affairs. Kansteiner had been a commodity trader with a long-standing professional interest in African products (cocoa, coffee, sugar) and a personal interest in African landscapes and issues before taking an earlier post, with the first Bush Administration, on the staff of the National Security Council. At his swearing-in ceremony for the assistant secretaryship, he spoke of five priorities that he felt should guide American policy toward Africa:

improved standards of living, democratic institutions, support for the fight against AIDS, conflict resolution, and "the environment," by which vague term he meant not just breathable air and drinkable water but also the conservation of species and ecosystems. How to deal with such vast concerns? Kansteiner was open to good ideas where he might find them.

Another crucial player was Dave Barron, a richly experienced behind-the-scenes networker who serves as a government-affairs adviser to several African leaders, including President Bongo. Through Barron, the assistant secretary met Mike Fay and heard about the urgent possibilities that existed in Gabon. Grasping that those possibilities were both real and large, Kansteiner provided support—first in the form of seed money, later by bringing Gabon's initiative to the attention of his boss, Colin Powell. Also through Dave Barron, Fay got the attention of another key State Department honcho, John Turner, the assistant secretary for oceans and international environmental and scientific affairs. Kansteiner, Turner, their deputies and staffs, and the newly appointed American ambassador to Gabon, Ken Moorefield, all



became energized toward involving the Bush Administration somehow in support of conservation in the central African region.

Barron worked meanwhile to bring some allies from Congress into the mix. On short notice he organized a private dinner at the Capitol Hill Club for about 60 people, at which the wine was good, the food was decent, and the marquee performers were Mike Fay and Nick Nichols, who together did what Barron recalls as “a brilliant dog and pony show.” Like the later one for President Bongo’s cabinet, this show featured soulful gorillas in place of dogs, body-surfing hippos instead of ponies. Although it was a business-suit sort of event in a tony Washington club, Fay went tieless and jacketless in a wrinkled plaid shirt. The evening reached an inspirational climax when, after Fay had spoken again about ecotourism

**“I AM AND ALWAYS WILL
BE A CONSERVATIONIST
FOR AFRICA.”
—U.S. SECRETARY
OF STATE COLIN POWELL**

economics, Representative Clay Shaw of Florida stood up and gave impassioned testimony to the conviction that, pragmatics aside, America should nurture conservation efforts in Africa because it’s flat-out the right thing to do. When the dinner ended, there was a consensus of certitude that something should, could, and would be done.

American commitment to the Congo Basin Forest Partnership took form quietly during the summer of 2002. Mike Fay stayed closely involved, drafting memos on his laptop even during a week spent chimpanzee-watching with Jane Goodall at a remote forest camp in the Republic of the Congo and e-mailing them off to Washington by satellite phone through a gap in the forest canopy. It all came to culmination when Omar Bongo and Colin Powell made their consecutive announcements in early September in Johannesburg.

For the Bush Administration, pledging 53 million dollars for Congo Basin forest protection may have seemed both an honest, generous act of principle and a relatively cheap way of blunting criticisms—from among the assembled delegates at Johannesburg, and around

Legacy

FOREIGN AID WILL HELP MAKE BONGO'S DECISION A TURNING POINT FOR GABON.

The last time he was in a forest like this was in Vietnam, U.S. Secretary of State Colin Powell (left) told Mike Fay as they toured Pongara National Park. The U.S. pledged \$53 million in aid to protect central African forests. Coastal parks like Akanda (right) are equally important, luring thousands of pelicans and shorebirds.



the world—that its postures on environmental agreements and its performance on conservation issues had been almost uniformly truculent and bad. To reaffirm his own earnestness, Secretary Powell stopped in Gabon before flying home, for a cordial meeting in Libreville to congratulate President Bongo and then a brief walk through the woods with Mike Fay.

The coastal forest where Powell and Fay took their stroll lies within another of the new national parks, Pongara. Whatever convergence of politics and principles brought these two unusual men together, in that wild place, on that day, doesn't matter so much as the question of what tangible results the Congo Basin Forest Partnership will yield, not just in Gabon but among the neighboring countries—Cameroon, Equatorial Guinea, the Central African Republic, the Republic of the Congo (Brazzaville), and the Democratic Republic of the Congo (Kinshasa). Colin Powell's outing with Mike Fay was less than a transect (let alone a megatransect) and more than a photo op. It was a signal moment in conservation history, and this time even the secretary of state wasn't wearing a jacket.

During my visit in January, President Bongo was occupied with regional diplomacy, helping mediate a fierce civil conflict in Ivory Coast.

The newspapers were full of it. The presidential jet zoomed in and out of Libreville. Unable to reach the busy president, I spoke instead with some of his ministers and other high advisers, among whom the most engagingly candid was the minister of defense, Ali Ben Bongo, who happens also to be one of the president's sons. Educated in Paris, Ali Ben is a heavysset man in his middle 40s who wears his family status and professional role lightly. I tagged along in his Super Puma helicopter during a daylong inspection visit to another of the new parks—Loango, along the southwestern coast—and shared a casual lunch overlooking the water with him, his wife, Mike Fay, and a small entourage.

Then the Super Puma carried us off again, farther down the coast, with Fay at the minister's elbow pointing out elephants and buffalo amid the forest clearings. In the back of the chopper, the minister's chief of staff tapped me excitedly on the shoulder and pointed to movement in a small clump of trees: *Look, Monsieur David,*

chimpanzees. Appreciating nature has become a national priority.

At the end of the day, Ali Ben Bongo and I sat aside for a few minutes of private talk. Not long before the cabinet-room meeting back in August, Ali Ben told me, his father gave him an inkling of what to expect. The president had seen all those new photos of Gabonese wildlife, he had met Fay, he had watched the National Geographic Television film *Africa Extreme* about the Megatransect. The images came as revelations. Because Gabon is still 75 percent jungle and has a small population and few roads, the president's family, like most of the affluent class, had done their traveling across it mainly by airplane. They seldom drove, Ali Ben said, and they certainly didn't walk through the forests and swamps. But then his father saw what Fay had seen—and he decided to do something.

The next crucial steps will be to organize effective management structures, train people for those management roles, establish real protection for the areas, and help Gabon's populace understand the importance of this initiative. Financial support, coming from the U.S. and other friends through the Congo Basin Forest Partnership, will be crucial. But the partners must realize, Ali Ben said, that Gabon itself—no one else—will define the goals and the methods of this parks initiative.

The defense minister added a personal note. When he was a teenager, raised in the palace and privileged to travel, he once visited the San Diego Zoo. There, for the first time in his life, he saw a Gaboon viper. It fascinated him and piqued his pride, but it also triggered an unease about the disconnection between creature and place. To see this formidable Gabonese snake, he'd had to go to California? "We don't want to get to a situation," he said now, "where we'd have to go to Europe, or the U.S., to see in zoos some of our own wildlife that have become extinct here." Better to preserve what Gabon has been given, in a superb network of parks such as his father has decreed, and let the world come to visit the snake.

"Imagine," said Ali Ben Bongo, "the third millennium. And we Gabonese still have a country to discover."

WEBSITE EXCLUSIVE

See video of Gabon's wildlife, enjoy the Sights & Sounds of Mike Fay's historic Megatransect, and join our online forum at nationalgeographic.com/ngm/0309.

The tropical sun sets over Loango National Park, near where Mike Fay ended the Megatransect—and helped launch a new dawn in Gabon.





WORLD PARKS AND PROTECTED LANDS



Hawaiian Islands, U.S.A. Mauna Loa is the world's largest volcano; Kilauea is one of the world's most active. Both are hot attractions at Hawaii Volcanoes National Park. The recently established Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve is the largest conservation area in U.S. history.



Galápagos National Park, Ecuador Giant tortoises live large in the Galápagos, where 11 distinct subspecies roam seven different islands in this isolated volcanic chain, visited by Charles Darwin in 1835.



Western U.S.A. Eleven western states encompass a vast jigsaw of protected lands, including wilderness areas, national monuments, wildlife refuges, scenic rivers, and national parks such as Arches (above).



Madidi National Park, Bolivia Macaws may outnumber humans in Madidi, Bolivia's second largest national park. A thousand species of birds and some 3,500 residents share this 7,297-square-mile preserve.



Amazon Basin, Brazil Indigenous peoples help manage Brazil's Mamirauá and Amanã reserves. Linked with nearby Jaú National Park, they protect some 22,000 square miles. Brazil plans to double the amount of protected rain forest over the next decade.



Arctic Regions Polar bears find safe haven in Canadian parks such as Ellesmere Island and Wapusk, and in Denmark's North-East Greenland National Park—at 375,300 square miles, the world's largest.



Sareks National Park, Sweden This remote 760-square-mile park—a favorite of experienced back-country hikers—boasts mountains and glaciers but no overnight tourist facilities.



African Reserves Chobe National Park in Botswana is part of the range of Africa's largest elephant population. Africa's protected lands total over 850,000 square miles, an area more than four times the size of Spain.



Sagarmatha National Park, Nepal Some 3,500 people live in Sagarmatha. The park's biggest attraction, Mount Everest, is a major source of income for its resident Sherpa people.

Gabon's new national parks join a long list of lands dedicated to the safekeeping of natural and cultural resources. The World Conservation Union (IUCN) currently recognizes more than 68,000 protected areas worldwide—only the larger of which are mapped here—and the number continues to rise. But designating worthy places is the easy part. True protection takes money, expertise, and ongoing community support, say parks advocates, who gather this month in Durban, South Africa, for the fifth World Parks Congress. This international forum meets once every decade to assess the state of protected areas and chart a course for the future. Included on this year's agenda: an honest appraisal of progress and setbacks.

■ PROTECTED AREA

NORTH
AMERICA

EUROPE

AFRICA

SOUTH
AMERICA

Antarctica A series of international agreements, beginning with the Antarctic Treaty signed in 1959, regulates the frozen continent's status as a "natural reserve devoted to peace and science."

ANTARCTICA

UNPROTECTED AREA
90% of Earth's
land surface

PROTECTED
AREA
10%

THE BIG PICTURE



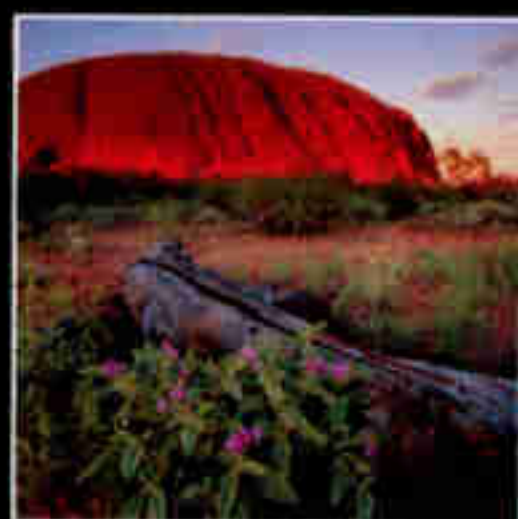
Wolong Nature Reserve, China Giant pandas freely chomp bamboo in this 772-square-mile reserve in Sichuan Province. Its diverse forests host pandas, the oxlike Sichuan takin, and other endangered species.



Kamchatka Region, Russia Crater lakes, ash-capped cones, and a diversity of plant and animal species mark this volcano-studded World Heritage site along the Bering Sea.



Gunung Palung National Park, Indonesia A tree frog's perch could be precarious in this 347-square-mile park. Much of its forested land is threatened by illegal logging.



Australia Uluru, also known as Ayers Rock (above), and the Great Barrier Reef, which extends more than 1,200 miles along the continent's east coast, stand out among Australia's protected areas. New Zealand has preserved more than a third of its land.

The World Conservation Union estimates that nearly 10 percent (some 5.7 million square miles) of the Earth's land surface is now designated as protected. Responsibility for set-asides such as national parks and wilderness areas falls to individual countries. International agencies designate areas of global importance, including World Heritage sites and biosphere reserves. □

PHOTO CREDITS HAWAII VOLCANOES: BRYAN LOWRY; SEAPICS; GALÁPAGOS: CRISTINA GOETTSCHE MITTERMEIER; ARCHES: ART WOLFE; MADIDI: JOEL SARTORE; BRAZIL: MICHAEL NICHOLS; NGS, ARCTIC: FLIP NICKLIN; SAREKS: JAN PETER LAHALL; CHOCHE: BEVERLY JOUBERT; SAGARMATHA: ANNE B. KEISER; WOLONG: DANIEL J. COX; NATURAL EXPOSURES; KAMCHATKA: SARAH LEEN; GUNUNG PALUNG: TIM LAMMAN; ULURU: ART WOLFE. PROTECTED AREAS DATA BY UNEP WORLD CONSERVATION MONITORING CENTRE, MARCH 2003; LAND IMAGE BY NATIONAL GEOGRAPHIC TELEVISION & FILM; NATIONAL GEOGRAPHIC MAPS

ASIA

AUSTRALIA

SLEEPING WITH THE FISHES

Deep


Sixty-five feet under the sea, scientists live and work in Aquarius, the world's only ocean-floor research habitat. Their studies on Florida's Conch Reef offer unique insights into the mysterious realm of the sea—still as unexplored as outer space.

By GREGORY S. STONE
Photographs by BRIAN SKERRY



Science



A large school of schoolmaster snappers is shown swimming in clear blue water. The fish are silvery with a prominent yellow stripe running along the side of their bodies. They are all facing in the same direction, creating a sense of movement and unity. The background is a deep, clear blue, suggesting an open ocean environment.

Seeking shelter, schoolmaster snappers dart under Aquarius, just as they would at a natural reef overhang. Installed here in 1992, this NOAA habitat has become part of the seascape, encrusted with corals and sponges. Camping inside is like being on safari for the aquanauts, who otherwise could mingle with the fish only on short dives.



We were 85 feet underwater and more than five miles off the Florida coast when the lights went out. It was night, and conservationist Craig Taylor and I had been diving for two hours by the dim beams of the Aquarius research station—our underwater home and, at that depth, our only safe haven. About the size of a railroad freight car, Aquarius looked like a spaceship on the seafloor, an interior glow filling her view ports, exterior spotlights illuminating her sides and legs. When she lost power, she simply disappeared into the inky blackness, and I felt as cut off from the world as an astronaut stranded in space.

I fought the impulse to head for the surface, which is what scuba divers are trained to do when they get into trouble, because this was no ordinary dive. For the past four days we'd been living in Aquarius as aquanauts, and by now our bodies were saturated with nitrogen. If I surfaced quickly, without decompression, dissolved nitrogen in my body would expand from the sharp decrease in pressure, forming bubbles that could painfully squeeze nerves, block blood flow, or cause brain damage. Decompression sickness probably would kill me.

Suddenly Aquarius's emergency siren started wailing—a signal for all aquanauts to return immediately. The piercing sound, however, seemed to come from all directions. Breathing heavily on my scuba tanks as I swam through the darkness, I used my emergency lights to search for the web of excursion lines that had been mapped out for us during our one-week training session. These guidelines were a safety measure to help us navigate around the reef. Grasping a black braided rope in one gloved hand, Craig and I followed the line back to the station, where we felt our way across the coral-and-algae-covered metal to the rectangular opening in the bottom known as the moon pool.

The station functions like an inverted glass pushed down into a bucket of water: An air pocket remains at the top of the glass while the glass remains upright. The crew maintains the air pressure inside Aquarius at the same high pressure as the surrounding ocean, keeping the water from rushing in. We lived in that air pocket, which I was eager to get back to. Emerging from the ocean water, I stood waist-deep in the moon pool, removed my regulator, and breathed in the hot, humid air from Aquarius.

"Generator's down," said Christian Petersen, a U.S. Navy diving medical officer, as he stood above me in the dim emergency lighting. Without power from either of the two electric generators in the life-support buoy tethered above us on the surface, we had only dim emergency lights and no air-conditioning. In these warm tropical waters, with a half dozen people inside, our small laboratory would rapidly become stifling. I climbed up the stainless steel steps, peeled off my dive gear, and began to sweat.

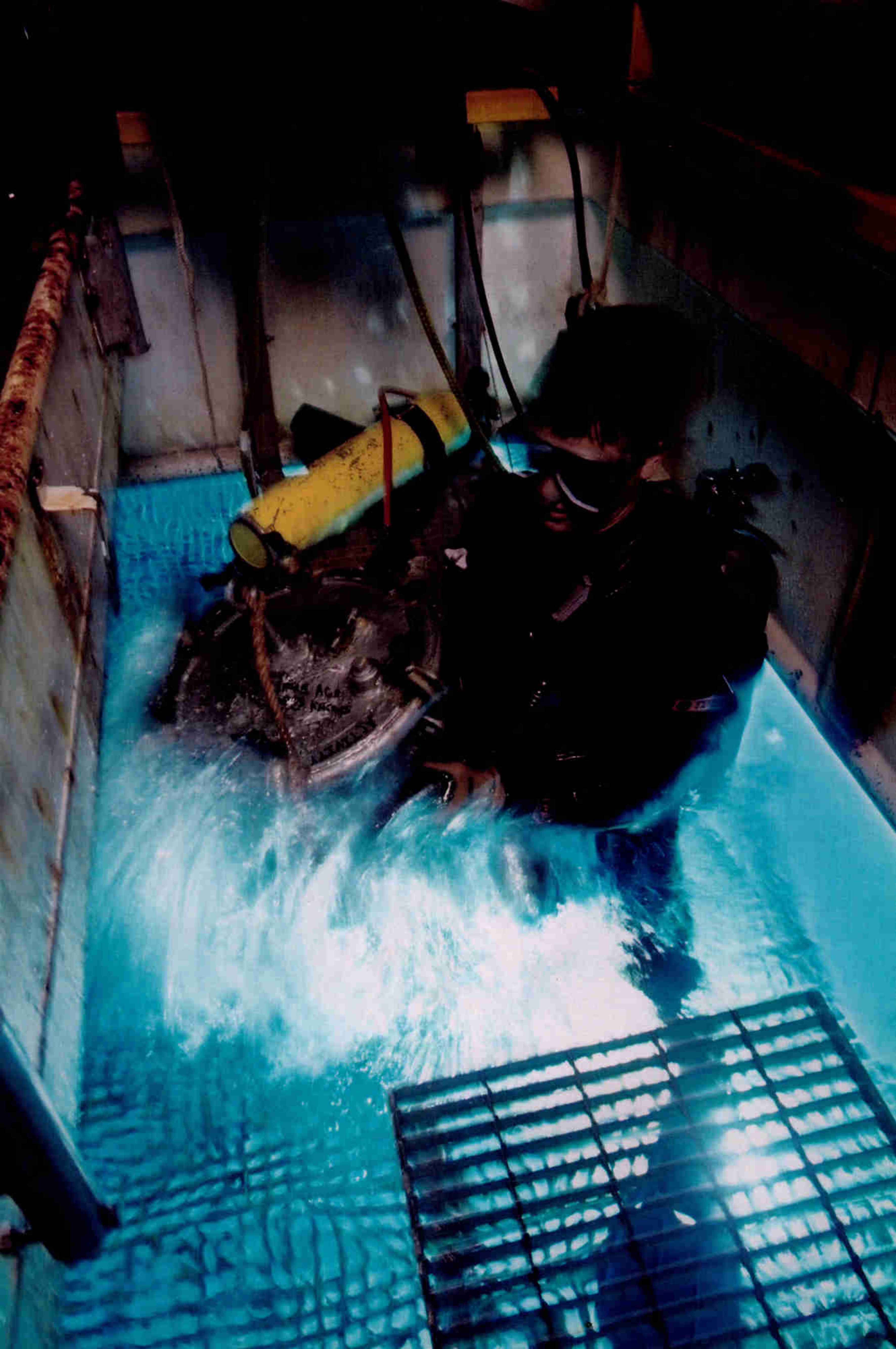
Technician Jim Buckley sent a radio distress call to the mission control team monitoring Aquarius ten miles away in Key Largo. Fortunately the team had seen the power outage on their computer screens and immediately had sent a speedboat to our rescue. Our six aquanauts—three scientists, a NATIONAL GEOGRAPHIC photographer, a medical doctor, and a technician—stood shoulder-to-shoulder in the three-by-eighteen-foot corridor of the dry main living area,



Vital Links

Splashing into a portal called the moon pool (right), a support diver delivers gear and food in a pot designed to withstand the high pressure—2.5 times that at the surface. In the cramped three-by-eighteen-foot work area (below) aquanauts e-mail a report to their base in Key Largo. The signal travels topside to a communications link in a buoy (above), which also holds air compressors and generators.





quietly and a little nervously waiting for help.

Forty-five minutes later, a crew from the National Oceanic and Atmospheric Administration's (NOAA) National Undersea Research Center finally arrived. Aquarius program technician Michael Hutchens popped his head up through the wet-porch door. "You guys all right?" he asked. Up above, the support crew cleared a blockage in the diesel engine's fuel line inside the life-support buoy, and our lives returned to "normal" in our home on the seafloor.

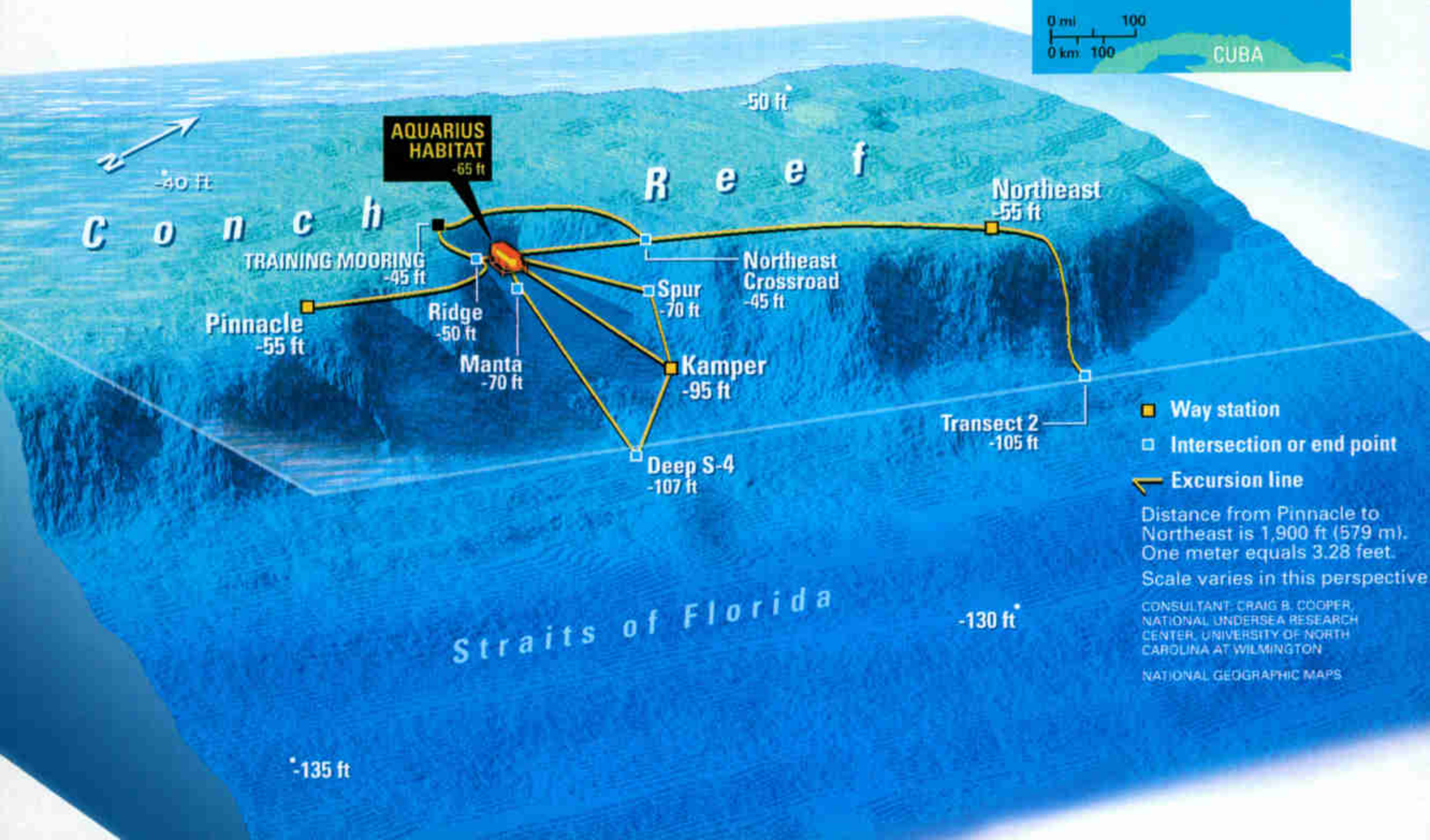
My mission at Aquarius was to track fish along coral reefs in the Florida Keys National Marine Sanctuary—one of 13 marine sanctuaries in the nation. As vice president for global marine programs at the New England Aquarium, I wanted to determine how far reef fish routinely swim during their daily migration. This was my third saturation mission in Aquarius, which was built in 1987 by the United States government to enable scientists like me to study the ocean by living on the seafloor. The big advantage in letting our bodies become saturated with nitrogen

was that we could dive all day without risk of decompression sickness, as long as we didn't surface (see art page 91).

Owned and funded by NOAA and operated by the University of North Carolina at Wilmington, Aquarius has hosted more than 70 missions. About 200 scientists have used the lab to study ocean issues such as how global warming affects corals, the condition of deep coral reefs, and how the ocean might provide new pharmaceutical drugs.

Living in Aquarius was like a spaceflight, a submarine ride, and a week in a college dorm wrapped in one. Because of all the valves, electronics, bunks, carbon dioxide scrubbers, fresh water jugs, dive gear, computers, and cameras we needed, it got very cramped. As we navigated the 40 feet from the bunk room to the wet porch we were always bumping into each other, searching for a place to sit or stand. To eat our freeze-dried meals or use our computers, we took turns sitting at a small table. There was so little room for photographer Brian Skerry's gear that he had to sleep with his camera housings and strobes. Even without camera gear, the bunks

Underwater Laboratory Investigating the impact of humans on the sea, teams of six aquanauts explore the Florida Keys National Marine Sanctuary around Aquarius. Sticking to a network of excursion lines and way stations (below), they often dive nine hours a day. In a rare quiet moment, author Greg Stone of the New England Aquarium watches from a porthole (far right).



were so small we could barely roll over. Nevertheless, at night as we lay sardine-like, packed 24 inches above and below each other, discussing the day's events, we found ourselves laughing uncontrollably at jokes that were mediocre at best.

At least we had an excuse: Breathing compressed air made us a little euphoric all the time. This "high," which feels like you've just had a glass of wine, is called nitrogen narcosis. It also causes occasional short-term memory confusion. Maybe it was narcosis or maybe it was the magic of living underwater, but time slipped by fast in our nonstop series of dives.

On my second morning in Aquarius, I was standing in the wet porch beside the moon pool, watching fish swim by in the clear blue water, when Boston University scientist Les Kaufman arrived from the world above. Rising up out of the water, he removed his regulator and mask, took a deep breath, and grinned.

"Ahhh, the smell of home!" he said, his voice sounding squeaky.

The pressurized air in Aquarius is denser than surface air—the equivalent of two and a half atmospheres. You can feel that the air is "thicker" as you breathe it in through your nose and lungs, and it alters odors. It also makes your voice higher than normal.

"I saw a blue parrotfish in the trap on my way down here," Les said.

"OK, let's start with him," I replied. I squeezed into my wet suit, shrugged on my tanks, and slipped into the moon pool. We slowly sank to the sandy seafloor beneath Aquarius.

Our goal was to become the first team to surgically implant electronic acoustic tags underwater in a variety of reef fish and track them in real time from Aquarius. Les, a veteran of two previous missions at the station, had not saturated with us this time since he was needed for related work at the surface. His plan was to swim down each day and spend 90 minutes on each dive—an extension over conventional scuba techniques made possible by a special breathing mixture called nitrox.

Establishing an operating room for fish

underwater was more challenging than we expected. We needed to learn new techniques for administering anesthesia, to communicate without speaking during surgeries, and to contain the fish during their recovery. But the extra

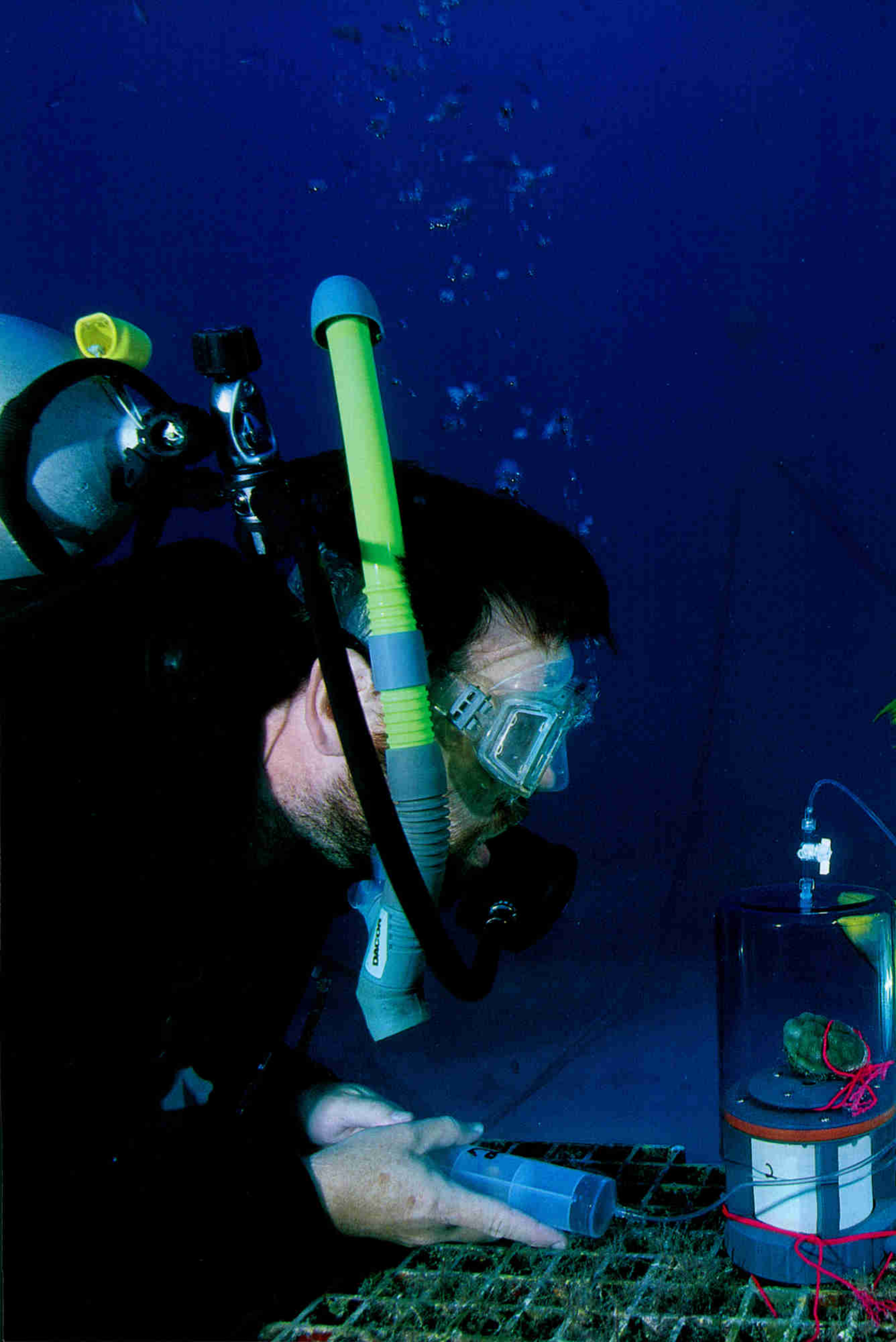
effort was worth it. Performing the surgery underwater would minimize the physiological trauma to our patients since the fish would remain at their normal depth and pressure throughout the procedure.

Swimming beneath the research station, I inspected the dishwasher-size fish trap, made of wire mesh, that we

used to catch our patients. With my dive mask pressed close to the trap I saw our first subject, an iridescent blue parrotfish, peering back at me. Pointing to the ten-inch-long fish, I made the OK sign to Les, and we both lifted the trap

Living in Aquarius was like a space-flight, a submarine ride, and a week in a college dorm wrapped in one.





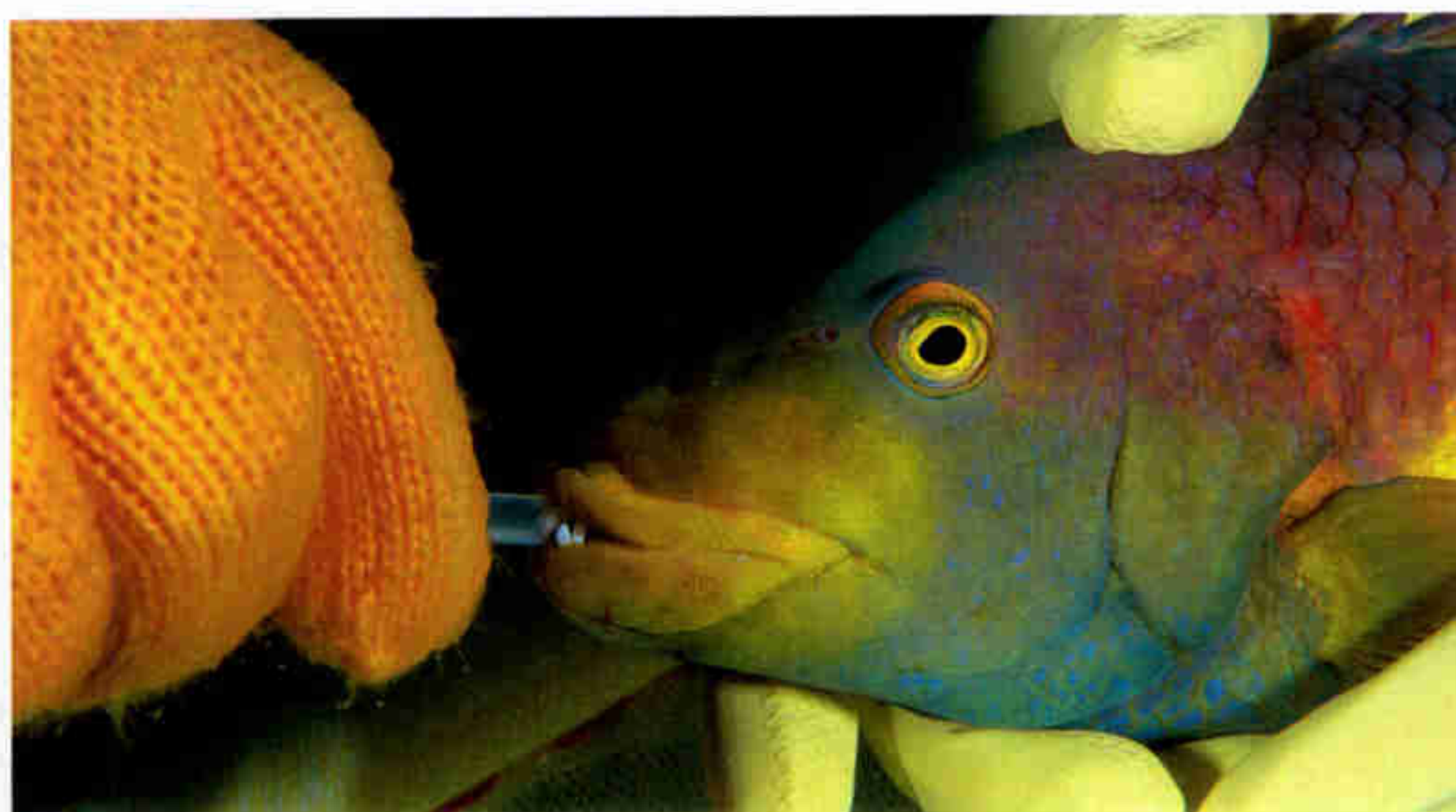
Global warming could radically alter coral reefs and their dependent communities. To discover how, biologist Les Kaufman, left, and Greg Stone put coral samples in water that's chemically adjusted to imitate what seas may be like in the year 2100. In similar experiments coral growth slowed by a quarter. "Coral is key to everything," says Stone. "All the reef animals and plants live in or on the coral."



Submerged surgery places tiny transmitters in fish without removing them from their environment—a tactic that minimizes trauma. First, a Spanish hogfish gets a dose of anesthetic (top). Already immobilized, a parrotfish rests on a makeshift stretcher (center). After a transmitter is inserted into an incision (bottom), Kaufman (right) moves the parrotfish through the water to help its gills flush out the anesthetic. “If the fish is released while it’s still dopey,” he says, “a predator is likely to clue in very quickly and make short work of it.” Tracking data show that the fish rarely migrate outside their protected coral reef home.

and swam it up to our work platform, which extended to the side of Aquarius next to the moon pool.

Our underwater operating room consisted of an 18-inch-long plastic gurney. After anesthetizing the parrotfish, we laid it on the gurney. Kneeling to do the surgery, Les carefully made a small incision, inserted an inch-long acoustic tag about the diameter of a pencil, and closed the incision with a simple suture. Whenever the fish moved a fin, rolled an eye, or expanded a gill during the 15-minute procedure, I administered more anesthetic, squirting the medication into the fish’s mouth with a syringe and plastic tube. Then I gently



cradled the fish until it awoke and swam off.

Later that day, after returning to Aquarius, I heard back from our parrotfish by a kind of e-mail. As I stood in the tiny lab, I watched as information on the fish's location, depth, and body temperature streamed onto my computer screen. Each acoustic pulse from the tag was like a message from our fish, which I learned from the data was about 300 feet south of Aquarius at a depth of 90 feet.

To confirm that the surgery had not harmed the parrotfish or altered its natural behavior, I asked aquanauts Craig Taylor and Ken Mallory to swim out into the reef that afternoon to locate it with portable acoustic trackers and

visually check on the fish's recovery.

"Make sure it's swimming upright and eating normally, and check that the sutures are holding," I told them. They stayed with the fish for several hours, watching it swim and graze on algae that covered coral rock on the reef surface.

During the next six days we repeated the surgery 23 times, tagging seven different species: blue parrotfish, hogfish, Spanish hogfish, moray eel, nurse shark, red grouper, and black grouper. Using a pair of acoustic receivers, we tracked the movements of these fish through their coral reef habitat.

After one round of surgeries, in a rare moment of quiet after Les had returned to the



surface, I was sitting at the small galley table in the main lock, sipping coffee and looking out the round view port at the mounded coral and schooling fish surrounding Aquarius.

"I hope our guys are OK," I thought, mulling over our recent procedures.

At that moment a six-inch-long Spanish hogfish, blue-violet and yellow, stopped outside the view port and gave me a wide-eyed look. Just then I heard my computer beep, as the fish's tag announced his visit. It was one of our former patients—healthy and full of life.

Our work at Aquarius was the fulfillment of a once futuristic dream. Forty years ago it was popularly believed that humans would routinely work and live underwater. Robert Sténuit became the first aquanaut to stay underwater in a pressurized environment for 24 hours, on September 7, 1962, after living at a depth of 200 feet in the Mediterranean Sea during a research project funded in part by the National Geographic Society. In 1963 U.S. Navy Capt. George Bond, using pressure chambers on land, proved that people could live under pressure and be decompressed safely. A rush of habitats followed, including Jacques Cousteau's Conshelf and the Navy's Sealab programs. All told, governments and scientific organizations around the world built more than 65 underwater habitats.

Noting the similarities between underwater habitat missions and space missions, NASA teamed up with the Navy and General Electric in 1969 to build the Tektite habitat. Aquanaut-astronauts spent up to 60 days living on the seafloor, at the time the projected length of future space missions.

The death of aquanaut Berry Cannon the same year from an improperly prepared rebreather during the initial stages of Sealab III ended the Navy's direct involvement. But underwater habitat programs continued until the 1980s. By then space exploration had proved better at capturing the public's imagination—and funding.

Eventually dreams of underwater cities were replaced by space stations, and all ocean research habitat programs except Aquarius ended. Now the underwater lab is once again attracting Navy

interest and is also being used by NASA to train astronauts in the ocean equivalent of a space station.

After six days on the seafloor it was time to rejoin the world above. The habitat would now serve as our decompression chamber. Known as the "pay as you leave" method of diving, our saturation required us to decompress for 16.5 hours before returning to the surface. On the last day of our mission everyone came inside and the pressure door was sealed.

We lay in our bunks—reading, sleeping, and some of us worrying about how our bodies would handle the change in pressure—while breathing pure oxygen for three 20-minute periods. Then the pressure was slowly lowered in precise increments until the internal pressure was equalized to surface pressure. Finally

the pressure would be briefly equalized to the surrounding ocean pressure again, making it possible for us to open the door and swim directly to the surface.

I was leaving Aquarius with a feeling of satisfaction. Our underwater tagging had been a success: The fish healed well and behaved normally without post-

surgical ill effects. We had also learned that many of the fish did spend most of their time within a limited area. These early results lend hope that marine sanctuaries may prove to be one of our most effective tools for saving the oceans from the overfishing, pollution, and destruction with which humanity has bombarded them for many years.

But the oceans need more help. During the 20th century many fish populations declined by 90 percent, and virtually all marine habitats near human settlements were degraded in some way. Along with other technologies, and information from the ocean animals themselves, the underwater lab has helped show us what the oceans were meant to be like. By allowing us to live with the fish, Aquarius has opened a new window on the watery 70 percent of our planet. The spaceship on the ocean floor has become one of the oceans' best defenses.

**Breathing
compressed
air made us a
little euphoric
all the time.**

WEBSITE EXCLUSIVE

What's it like to live under the sea? Visit our website to watch video from inside the Aquarius research station at nationalgeographic.com/ngm/0309.

The dangers of deep breathing



1 SEA LEVEL

Breathing normally

The air we breathe contains about 21 percent oxygen, 78 percent nitrogen, and trace gases. During respiration, as the body absorbs oxygen and expels carbon dioxide, nitrogen and the trace gases flow harmlessly in and out of the lungs.



2 GOING DOWN

Nitrogen floods the body

As a diver descends, the increasing pressure forces nitrogen to dissolve in the blood and tissues. Aquanauts inside Aquarius reach saturation, the point where they can absorb no more nitrogen, after about 24 hours and then begin to exhale the gas.



3 COMING UP

A safe return takes time


Ascending slowly lets the body gradually flush out the nitrogen it has absorbed. Rising too fast causes nitrogen to form bubbles, which can inflict pain in joints and muscles—the bends—and can even lead to death.

ART BY WILL NELSON; GRAPHICS BY TIMOTHY ALT

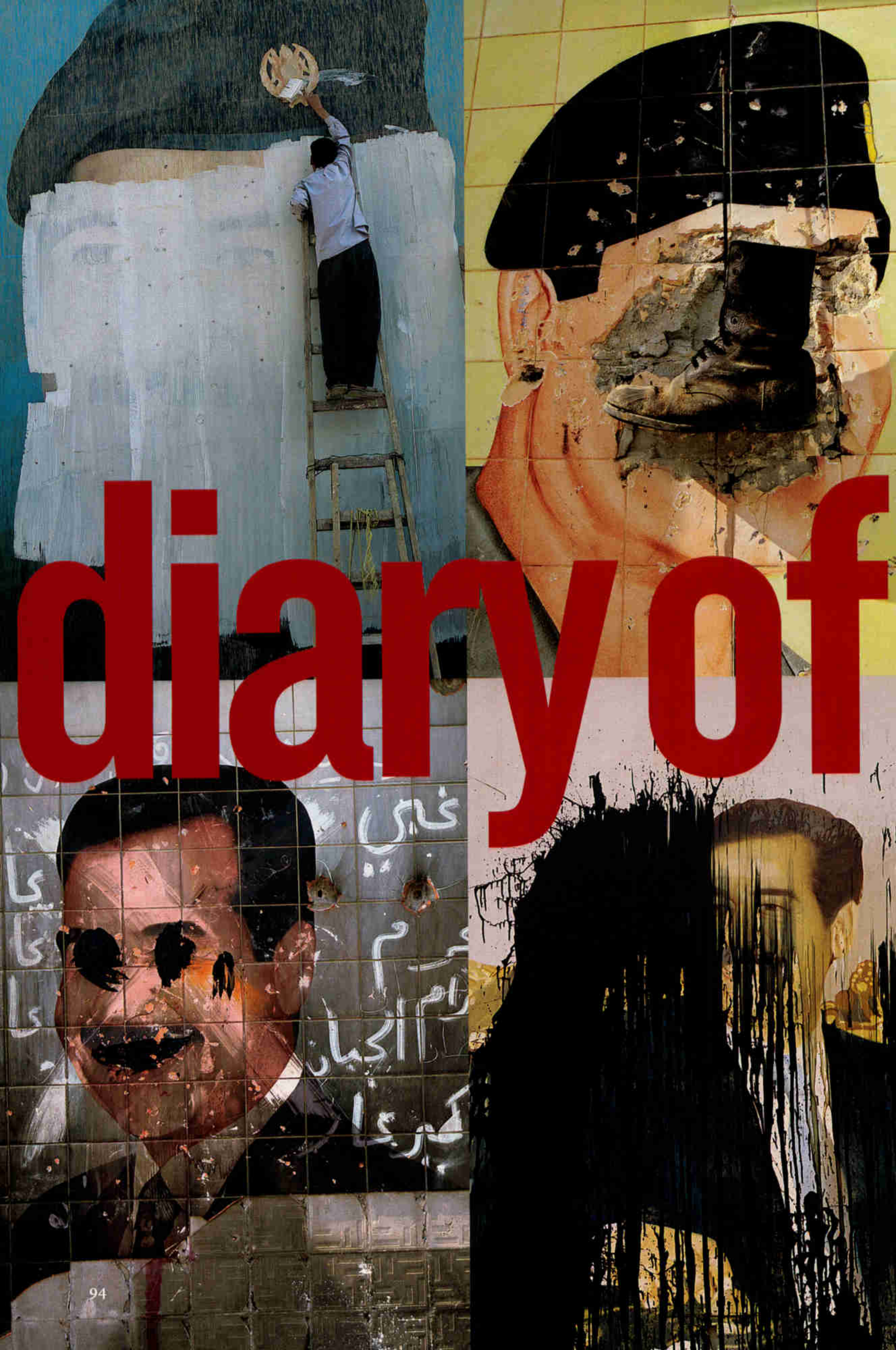


Paying for his week in Aquarius, Craig Taylor of the Wildlife Conservation Society begins 16.5 hours of decompression by breathing oxygen on and off for an hour. In their own bunks the other aquanauts do the same. "Our Navy dive doctor checked on us through the night," he said. Simulating a prolonged ascent from a dive, pressure in the entire habitat decreases slowly so that everyone can expel the built-up nitrogen before they surface.





In the crystal sphere of a rest station filled with air, Greg Stone trades the tunnel vision of his diving mask for a wider view of the underwater world. While living here with the fish, he and the other aquanauts helped confirm the success of the marine sanctuary—and showed the need for broader protection of our oceans. □



diary of



a war

EYE ON IRAQ: PART TWO

Life in Baghdad during the war and its aftermath
as seen by veteran photographer **ALEXANDRA BOULAT**

AFTER U.S.-LED TROOPS ARRIVED, PICTURES OF SADDAM HUSSEIN WERE DEFACTED ALL OVER BAGHDAD.

EDITOR'S NOTE *Soon after publishing Alexandra Boulat's pictures of Baghdad in the June issue, we began questioning our original plan to present part two of her story—of Iraq during and after the bombing. From the work of other photographers, embedded and not, war images already had become frozen in our minds. What more was there to see, or to say? Then we received Alexandra's second shipment of photographs, and we realized that, in venturing out of her hotel each day for three months, she had captured what we hadn't yet seen: the war as it was experienced on the streets of Baghdad.*

► WEBSITE EXCLUSIVE: Experience the Sights & Sounds of Iraq in transition and hear more of Alexandra's diary at nationalgeographic.com/ngm/0309.





MARCH 25 **The Storm Behind the Calm**

The bombing has slowed a bit—maybe because of the sandstorm that's stifled Baghdad for the past two days, blanketing the city in an ominous red glow and lulling its residents into a strange lethargy. Old-timers I talk to can't remember anything like it in their lifetime. Soldiers wander around in the haze, saying it's a gift from God because it's thwarting the U.S.-led troops' advance on the city. This is exactly the kind of dusty, oppressive weather that people usually hate, yet now everyone is hoping the storm will never end.



MARCH 26 **Bored and Besieged**

So far the bombs have been amazingly accurate, but even so the safest strategy is to remain inside. Today I managed to have tea with the family of a low-level Baath Party loyalist. Toting an assault rifle, he went in and out to meet friends while his son and teenage daughter were confined indoors, feeling trapped in their two-room apartment and listlessly watching television reruns of Saddam Hussein in action. The Ministry of Information prohibits journalists from spending much time with private citizens, so after 15 minutes my minder insisted I leave.







MARCH 27 **Awash in War**

The bombing has been going on for a week now, and everyone is so tired of it. Women are the most affected by war, I think, because even as the bombs are falling, they still have to cook the meals and wash the clothes, and they worry for their children. Old and young alike are coughing from the oil fires set by the Iraqis to create a wall of smoke in an attempt to confuse coalition aircraft. Before the bombing started, when people were nervous about what was to come, I'd say, "Don't worry. It will be short." But the truth is, war is never short when you're living it.



This morning I saw a man getting a haircut in a building next to a bombed-out communication center.

In one sense that's crazy, risking your life to get a haircut. But these are crazy times. Last night I couldn't decide whether to take my first bath in weeks—what if a bomb dropped while I was in the tub? So I understood this man's desire for normalcy, his early morning trip to this barbershop, with its pictures of Saddam and Elvis testifying to the mix of influences that have made up modern Iraq. An hour after I left, the building next door was bombed again.



يسار





MARCH 29 **Raw Ritual**

At nine o'clock tonight I got word that about 50 people had been killed in an explosion in a shopping area on the edge of Baghdad. Some of the victims had been taken to a nearby mosque. "Can I go in?" I asked when the door opened, though I didn't know what was inside. And maybe because I am a woman, I was allowed into a stark room where two women were preparing to bathe the body of a relative before burial. It's unclear whether the explosion was caused by a coalition bomb or an Iraqi missile, but it didn't matter for this young girl.

APRIL 9 | Bringing Down Saddam

No one knew how the Iraqis would react when the Americans arrived in Baghdad, and at first I felt tense and scared. Just yesterday some jittery American soldiers in a tank shot at the Palestine Hotel, where I'm staying, killing two journalists. But I knew the tide was turning today when a hundred or so citizens gathered in Firdos Square outside the hotel to topple Saddam's statue. When pulling on a rope around his neck didn't do the job, an American tank came to the rescue.









APRIL 9 Frenzy of Freedom

The U.S. soldiers were exhausted from their weeks in the desert, but they still had enough energy to help the Iraqis pull down this statue. A marine covered Saddam's face with an American flag for a moment and then had second thoughts. Once the statue came down, the Iraqis began jumping on it, pulling the head around the city in an exuberant display. The journalists who had been embedded with the troops were now in the city, and as we all shot the scene, it was so clear that it was a pivotal moment. For the first time in days the smoke from the oil fires lifted, and the sky was blue again. There was an incredible sense of relief among the crowd, not only because of rumors that Saddam had fled Baghdad, but because everyone knew that the bombing would stop.



APRIL 10 | Taking Something Back

Already, yesterday's moment of peace is gone, replaced by growing anarchy and uncertainty. With no more dictatorship and no more rules, Baghdad is in the hands of the looters. I watched hundreds of people, including women and children, stream out of Saddam City—a slum in Baghdad where nearly two million Shiite Muslims live—into downtown to grab everything from food to furniture. I followed gangs trashing and burning ministry buildings, department stores, museums—even hospitals and jails. Yes, they wanted the stuff, but they also wanted revenge for the years of oppression.



APRIL 11 **Not in My Backyard**

"What should I photograph now?" I asked my Iraqi friend Rad yesterday. "The looting of the palaces?" And he got upset with me. "These looters are not true Iraqis," he said. So I went to a neighborhood that was organizing to keep away the looters. Middle-class men set up checkpoints and barricades on the streets, stopping cars and threatening anyone who looked suspicious. Tonight I heard gunfire around the city. Baghdad isn't safe anymore, and no one knows who to blame.







Before the war Iraqis told me, "It doesn't matter if I'm Shiite or Sunni," referring to the two major sects of Islam. Today proved otherwise. At noon on this Friday, thousands of Shiites gathered outside a mosque in Saddam City to pray openly after decades of persecution. Shiites make up 60 percent of Iraq's population, but under Saddam's secular yet Sunni-dominated regime, some Shiites had been killed for attending large Friday prayer services.



APRIL 23 **Old Passions Unleashed**

I kept wondering if a moment would come when the Iraqis would celebrate the end of the war. Today I realized this was it. Crowds of Shiite pilgrims have poured into the city of Karbala, 50 miles from Baghdad, to commemorate the martyrdom of Imam Husayn, grandson of the prophet Muhammad. The most zealous cut their heads to express their grief. Under Saddam's regime, this Shiite ritual was banned as too extreme.





APRIL 28 Recovering the Past

As the fighting began to wind down, I watched Iraqis dig up the victims of Saddam's regime. Outside Baghdad, in a cemetery near the Abu Ghurayb prison where hundreds of his opponents were executed, about a thousand people were buried with only numbers to mark the graves. Now families are getting access to prison records and coming to identify loved ones and give them a proper burial. The war may be ending, but the healing has only begun. □





97210

Solace in the City


BY KEVIN KRAJICK

PHOTOGRAPHS BY

MARIA STENZEL



Portlander Ranger Hughes soaks up sun with his crop in a community garden beside Forest Park—"The city's saving grace," he says, "or at least part of it."



Sometimes I imagine early America as a sort of lost paradise: a place of boundless forest and riverscape, where farms carved from the wild had room for both wolf and lamb, and men lived in peace with nature—and each other. Things may never have been that good. Yet I've found an echo of my peaceable kingdom in a small piece of Portland, Oregon. It starts on a steep ridge crowned with the country's biggest, wildest urban forest; cascades down hillsides of storybook houses and gardens; then hits the Willamette River waterfront, where men and women still sweat the big stuff, wrestling masses of steel, lumber, and grain. It's all within a ten-minute walk, just off center city.

This rich urban ecosystem happened partly by accident. When William Clark (of Lewis and Clark) canoed by in 1806, old-growth trees were plentiful, but within a few years of Portland's start in 1845 so many were gone the place was nicknamed Stumptown. On the heights, up Balch Creek Canyon,

some old growth escaped—and when developers subdivided nearby denuded slopes in the early 1900s, hoping to build houses, landslides ruined their plans. Oregon's mild, rainy climate did the rest, returning hills to woods. Soon Portland cultivated a new nickname—City of Roses. Today Forest Park, with more than 5,000 acres of trees, 112 species of birds, and 62 species of mammals, dominates zip code 97210.



Outdoor recreation is to Portland as horses are to cowboys; thousands hike, bike, and jog in the park.

That includes 80-year-old Jim Morris, whom I met one morning on a five-mile hike with other seniors, loping along like 30-year-olds. "The availability of nature is what makes Portlanders so healthy," said Morris, a Bronx native. "It makes the city *livable*."

With my guide Sam Wilson, a skinny 15-year-old, I mountain-biked a winding dirt road through woods that occasionally opened to foggy vistas of riverside oil depots, docks, and rail yards far below. Distant ship horns and the bangs of coupling freight trains floated up, providing pleasing counterpoints to birdsongs. Sam and friends have an obstacle course of planks and logs they call Neverland deep in the woods. Pulling up shirt and pants, he showed scars, scrapes, and his second set of stitches in two weeks, running under his chin like the goatee he is too young to grow.

Within a metro area grown to almost two million people, the park shows scars too. One afternoon after a cool rain I hiked up Balch Creek Canyon with park manager Fred Nilsen. Wet fir and dirt smell wafted up; autumn maple leaves cascaded down. Nilsen pointed out the country's tallest urban tree: a 241-foot Douglas fir. But he says few new conifers are sprouting, possibly from too much trampling. We reached a stone ruin, a 1930s rest room now roofless and mossy, known as the Witches'

Largest urban wilderness park in the U.S., Forest Park draws wildlife from the Coast Range. Nearby, urban mammals grab breakfast at the Stepping Stone Café (below).



97210

POPULATION: 10,219

MAMMAL SPECIES: 63

(including *Homo sapiens*)

AVERAGE RAINY DAYS

A YEAR: 151

MILES OF TRAIL IN

FOREST PARK: 80



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House. In a dark alcove something stirred—three homeless teens, Yoshi, Chickie, and Gremlin. “Got a cigarette?” asked Gremlin. The homeless haunt 97210; compassionate Portland provides food and showers at community centers.

Nilsen is too nice to throw the kids out. “Besides,” he said, “I got weeds to pull.” He meant the park’s main threat: invasive exotic ornamentals, especially English ivy, a glossy creeper that strangles native plants and trees. The No Ivy League, a citywide group, is dedicated to the proposition that ivy is, as Sandy Diedrich, the director, puts it, “the cockroach of the plant world, a primeval, cunning foe straight from the heart of darkness.” Every Saturday teams claw back mats of it. They’ve liberated more than 25,000 trees—just a start.

Some ivy comes from Willamette Heights, a residential isle of 250 houses cradled on three sides by park, reached on the fourth via the Thurman Street Bridge across Balch Creek. Along winding lanes and ravine edges, early gentry affixed houses to fit the topography: little Victorians and bungalows enclosed by profuse gardens. Willamette is now a place of long memory, where homes are known by the names of previous owners, and where if anyone moves, it’s often to a house nearby. Writer Ursula K. Le Guin has lived for 43 years in the same modest house where she raised three children. In her tribute to the neighborhood, *Blue Moon Over Thurman Street*, she wrote: “A street that ends in a forest—there is a magic there.”

In the heights, generations of children have grown up exploring the woods, and a rototiller is thought a fine Mother’s Day present. Chet Orloff’s backyard Pinot Noir vineyard is tucked away so nicely, he could work it in the nude. When his father died, the family used his ashes to help plant cedars in the park. A while back Phyllis Stevenson opened her back door to see Mac, her cat, being carried off by a coyote—common here and accepted as part of the big picture. The most telling landmark: a small granite fountain at Thurman and 31st, built in 1917, paid for in part by kids who pitied the workhorses that hauled groceries up. It has a bubbling spigot for people, a trough for the horses, and near the bottom, a drinking spot for dogs and raccoons.

Tree-strangling English ivy can’t run from the No Ivy League, which “takes no prisoners,” says boss Sandy Diedrich. The group has freed 25,000 trees.



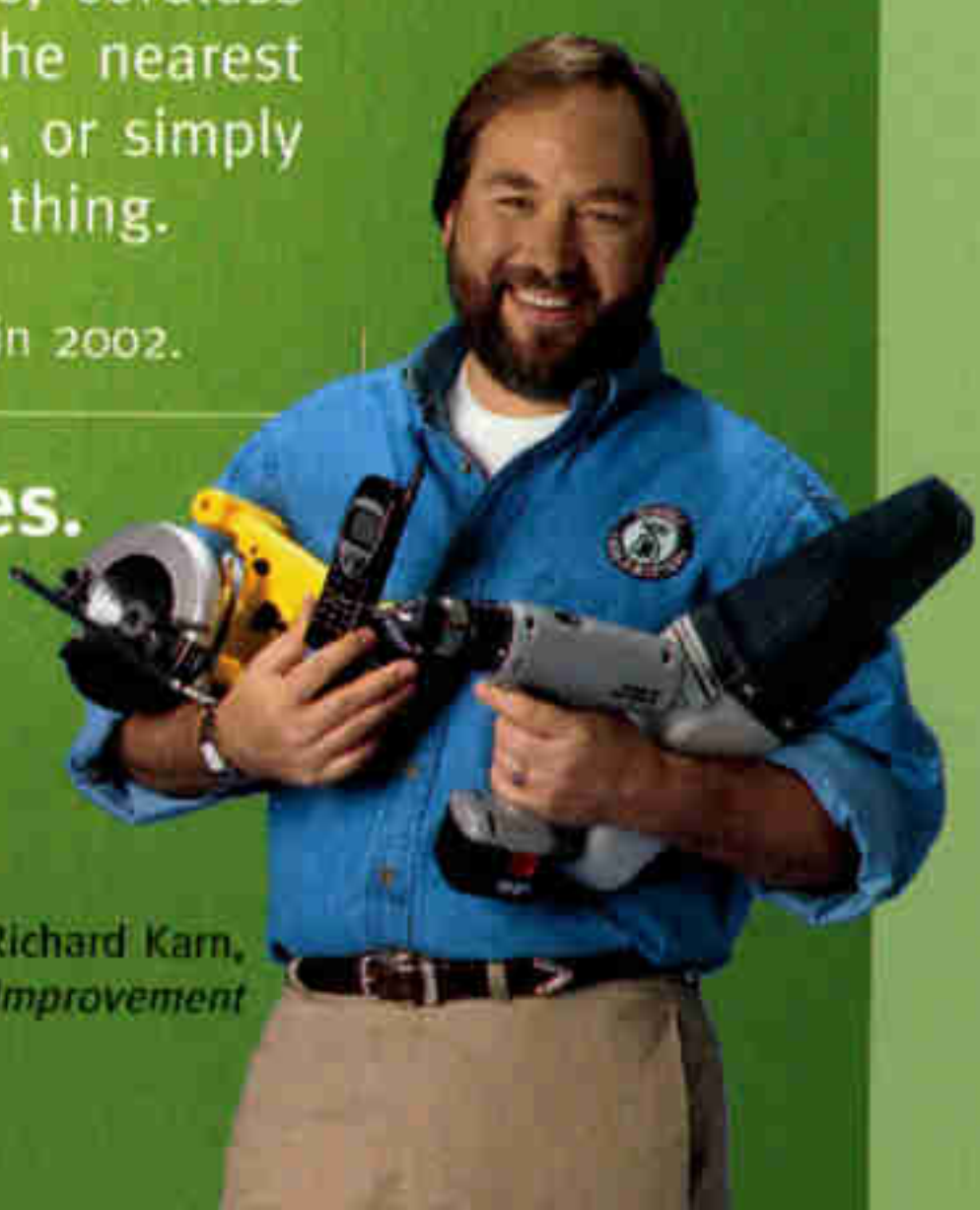


It's easy to be green.

And it's easy to recycle your rechargeable batteries once they've worn out. You know – the ones in laptop computers, cell phones, PDAs, cordless power tools, camcorders and remote control toys. To find the nearest collection site, visit www.rbrc.org/ng, call **1-800-8-BATTERY**, or simply stop by one of the listed national retailers. So do the green thing.

RBRC was named "Environmental Partner of the Year" by The Home Depot in 2002.

Recycle your rechargeable batteries.



RBRC Spokesperson Richard Karn,
"Al" from TV's *Home Improvement*



Drop off your rechargeable batteries at the following national retailers:

In the US:

Best Buy
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Wal-Mart

In Canada:

Bell Mobility
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Future Shop
The Home Depot
Motorola Cellular
Dealers
RadioShack
Sears
The Sony Store
TELUS Mobility

PORTLAND, OREGON



At the hills' feet on the "flats" are the stores, mostly small, all pedestrian friendly. Early developers made blocks with diminutive 200-foot sides in order to sell more corner lots, and thus unwittingly created an intimate, village-like atmosphere. Motorists make eye contact and *smile*. Restaurants and cafés line the streets. Frequent drizzle makes Portland quintessential double-latte country; Caffe Fresco will even scramble your eggs with espresso-machine steam. Such places employ a species called *baristas*—enthusiastic, body-pierced youth who need jobs when not out hiking or snowboarding.

Beyond this lies the riverfront industrial district. One afternoon down there I glimpsed a ragged, long-haired figure with a mountain bike, digging copper piping from a trash bin. He was Dave Reinhardt, and he lived under a bridge by the river. At a friendly scrap dealer he got \$13.69 for his day's load. "Portland is great," said Dave. "The world is screwed up."

On my last morning I escaped back to Forest Park. A few hundred yards above Aspen Avenue, English ivy gave way to native Oregon grape, sword fern, towering Douglas fir, mossy-trunked vine maple. It was quiet. Rain pattered briefly. Sunbeams appeared. A spider web brushed my head. Songbirds flitted branch to branch. Then: a great, distant ship's horn, like a one-note aria. Through the

trees somewhere below, children laughed. Maybe it *was* once this good. □

Café hands, known as *baristas*, let off steam at Java Vivace. "There's a coffee shop for you in Portland, no matter who you are," says Alia Aruta (above, at left). Marathoners get a caffeine-free boost from spectators along their route. Says Sherry Linder (below, third from right), "People support this community in a huge way."

WEBSITE EXCLUSIVE

Find more 97210 images along with field notes and resources at nationalgeographic.com/ngm/0309. Tell us why we should cover **YOUR FAVORITE ZIP CODE** at nationalgeographic.com/ngm/zipcode/0309.





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ONE THAT ALMOST GOT AWAY

Final Edit



ZEBRAS

A Tale of Too Many Stripes

In the quiet aftermath of a crocodile's violent kill, photographers Anup and Manoj Shah captured this study in contrasts—a wary predator guarding its prey in Kenya's Mara River.

The story's design editor, Elaine Bradley, found the image graphically irresistible. "You have this great juxtaposition of color, shape, and texture, then *boom*, right in the middle you have this eye that sucks you in," she says. But when you're working on an article about zebras, bold graphic images come easy, and the story was quickly full of them. "We had stripes in motion, stripes en masse—and there were other good pictures of predation," says Elaine. "So, unfortunately, we had to let this one go."

WEBSITE EXCLUSIVE

Cut it or keep it? Find out more about what tipped the balance for this photo and send it as an electronic greeting card at nationalgeographic.com/ngm/0309.

I am stronger than diabetes.®



FOR PEOPLE WITH TYPE 2 DIABETES

Avandia®

rosiglitazone maleate

“Every big hug makes me glad I take care of my diabetes.”

“My granddaughter sure knows how to make my day. Her face lights up when she sees me. Then, she dishes out those hugs—and *that’s* what really makes me want to take care of my diabetes.

“I’ve got my routine down: I stay active, and try my best to eat healthier meals. To help me stay on track, my doctor added *Avandia*. It makes my body more responsive to its own natural insulin, so I can control my blood sugar more effectively.

“I started on *Avandia* over a year ago, and while not everyone gets the same results, my blood sugar has never been better. I know *Avandia* is helping me to be stronger than diabetes. That’s something I can really wrap my arms around.”

Avandia, along with diet and exercise, helps improve blood sugar control. It may be prescribed alone, with metformin, sulfonylureas, or insulin. When taking *Avandia* with sulfonylureas or insulin, patients may be at increased risk for low blood sugar. Ask your doctor whether you need to lower your sulfonylurea or insulin dose.

Some people may experience tiredness, weight gain or swelling with *Avandia*.

Avandia may cause fluid retention or swelling which could lead to or worsen heart failure, so you should tell your doctor if you have a history of these conditions. If you experience an unusually rapid increase in weight, swelling or shortness of breath while taking *Avandia*, talk to your doctor immediately. In combination with insulin *Avandia* may increase the risk of other heart problems. Ask your doctor about important symptoms and if the combination continues to work for you. *Avandia* is not for everyone. *Avandia* is not recommended for patients with severe heart failure or active liver disease.

Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking *Avandia*.

If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking *Avandia*.

See important patient information on the adjacent page.

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2 mg, 4 mg, and 8 mg Tablets**

What is Avandia?

Avandia is one product in a class of prescription drugs called thiazolidinediones (thigh-a-zol-a-deen-die-owns) or TZDs. It is used to treat type 2 diabetes by helping the body use the insulin that it is already making. *Avandia* comes as pills that can be taken either once a day or twice a day to help improve blood sugar levels.

How does Avandia treat type 2 diabetes?

If you have type 2 diabetes, your body probably still produces insulin but it is not able to use the insulin efficiently. Insulin is needed to allow sugar to be carried from the bloodstream into many cells of the body for energy. If insulin is not being used correctly, sugar does not enter the cells very well and builds up in the blood. If not controlled, the high blood sugar level can lead to serious medical problems, including kidney damage, blindness and amputation.

Avandia helps your body use insulin by making the cells more sensitive to insulin so that the sugar can enter the cell.

How quickly will Avandia begin to work?

Avandia begins to reduce blood sugar levels within 2 weeks. However, since *Avandia* works to address an important underlying cause of type 2 diabetes, insulin resistance, it may take 8 to 12 weeks to see the full effect. If you do not respond adequately to your starting dose of *Avandia*, your physician may increase your daily dose to improve your blood sugar control.

How should I take Avandia?

Your doctor may tell you to take *Avandia* once a day or twice a day (in the morning and evening). It can be taken with or without meals. Food does not affect how *Avandia* works. To help you remember to take *Avandia*, you may want to take it at the same time every day.

What if I miss a dose?

If your doctor has prescribed Avandia for use once a day:

- As soon as you remember your missed dose, take one tablet anytime during the day.
- If you forget and go a whole day without taking a dose, don't try to make it up by adding another dose on the following day. Forget about the missed dose and simply follow your normal schedule.

If your doctor has prescribed Avandia for use twice a day:

- As soon as you remember the missed dose, take one tablet.
- Take the next dose at the normal time on the same day.
- Don't try to make up a missed dose from the day before.
- You should never take three doses on any single day in order to make up for a missed dose the day before.

Do I need to test my blood for sugar while using Avandia?

Yes, you should follow your doctor's instructions about your at-home testing schedule.

Does Avandia cure type 2 diabetes?

Currently there is no cure for diabetes. The only way to reduce the effects of the disease is to maintain good blood sugar control by following your doctor's advice for diet, exercise, weight control, and medication. *Avandia*, alone or in combination with other antidiabetic drugs (i.e., sulfonylureas, metformin, or insulin), may improve these other efforts by helping your body make better use of the insulin it already produces.

Can I take Avandia with other medications?

Avandia has been taken safely by people using other medications, including other antidiabetic medications,

birth control pills, warfarin (a blood thinner), Zantac® (ranitidine, an antiulcer product from GlaxoSmithKline), certain heart medications, and some cholesterol-lowering products. You should discuss with your doctor the most appropriate plan for you. If you are taking prescription or over-the-counter products for your diabetes or for conditions other than diabetes, be sure to tell your doctor. Sometimes a patient who is taking two antidiabetic medications each day can become irritable, light-headed or excessively tired. Tell your doctor if this occurs; your blood sugar levels may be dropping too low, and the dose of your medication may need to be reduced.

What are the possible side effects of Avandia?

Avandia was generally well tolerated in clinical trials. The most common side effects reported by people taking *Avandia* were upper respiratory infection (cold-like symptoms) and headache. When taking *Avandia* with sulfonylureas or insulin, patients may be at increased risk for low blood sugar. Ask your doctor whether you need to lower your sulfonylurea or insulin dose.

Some people may experience tiredness, weight gain, or swelling with *Avandia*.

Avandia may cause fluid retention or swelling which could lead to or worsen heart failure, so you should tell your doctor if you have a history of these conditions. If you experience an unusually rapid increase in weight, swelling or shortness of breath while taking *Avandia*, talk to your doctor immediately. In combination with insulin, *Avandia* may increase the risk of other heart problems. Ask your doctor about important symptoms and if the combination continues to work for you. *Avandia* is not for everyone. *Avandia* is not recommended for patients with severe heart failure or active liver disease.

Also, blood tests to check for serious liver problems should be conducted before and during therapy. Tell your doctor if you have liver disease, or if you experience unexplained tiredness, stomach problems, dark urine or yellowing of skin while taking *Avandia*.

If you are nursing, pregnant or thinking about becoming pregnant, or premenopausal and not ovulating, talk to your doctor before taking *Avandia*, as *Avandia* may increase your chance of becoming pregnant.

Who should not use Avandia?

You should not take *Avandia* if you are in the later stages of heart failure or if you have active liver disease. The following people should also not take *Avandia*: People with type 1 diabetes, people who experienced yellowing of the skin with Rezulin® (troglitazone, Parke-Davis), people who are allergic to *Avandia* or any of its components and people with diabetic ketoacidosis.

Why are laboratory tests recommended?

Your doctor may conduct blood tests to measure your blood sugar control. Blood tests to check for serious liver problems should be conducted before starting *Avandia*, every 2 months during the first year, and periodically thereafter.

It is important that you call your doctor immediately if you experience unexplained symptoms of nausea, vomiting, stomach pain, tiredness, anorexia, dark urine, or yellowing of the skin.

How should I store Avandia?

Avandia should be stored at room temperature in a childproof container out of the reach of children. Store *Avandia* in its original container.





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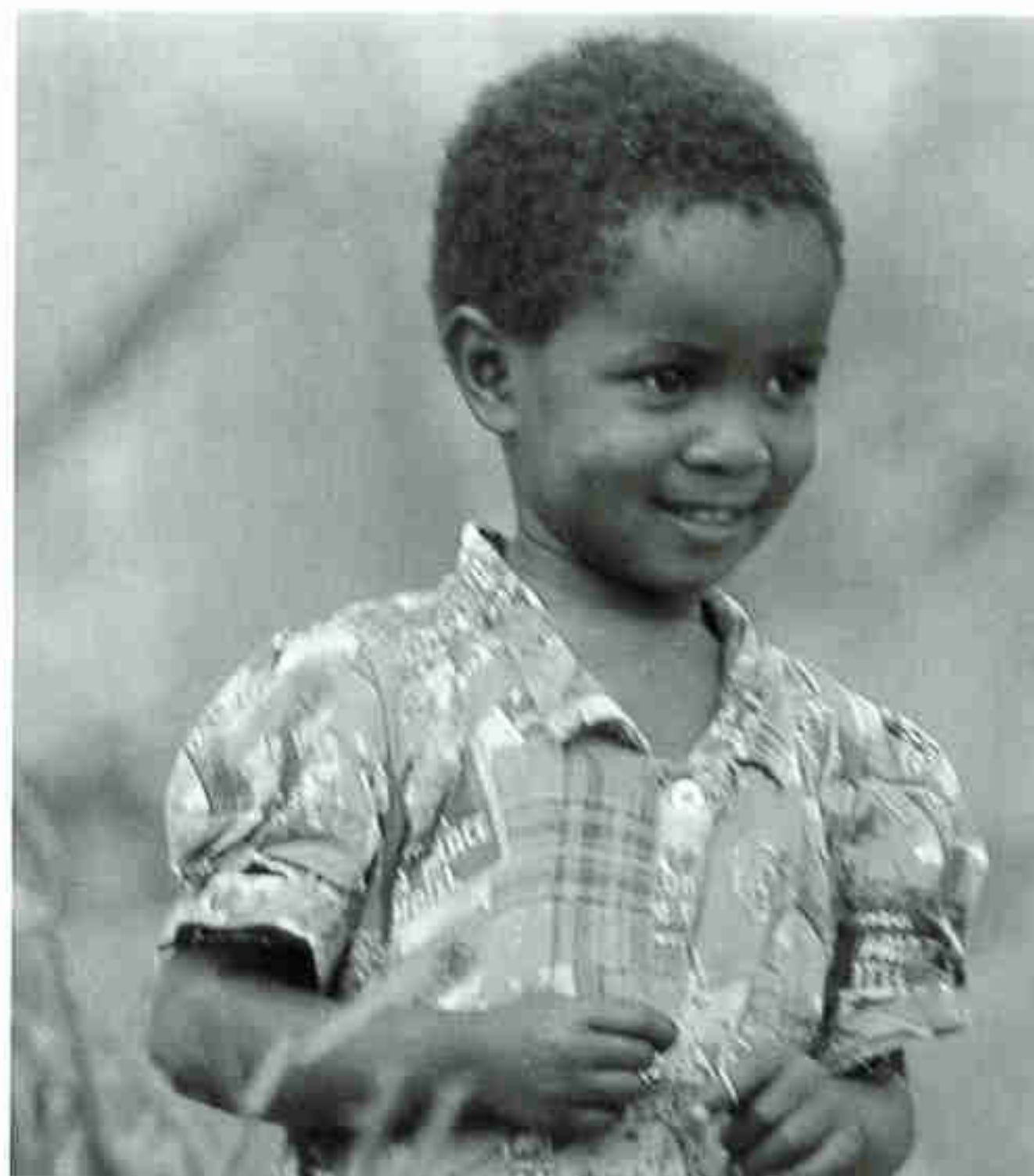
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DEEP SCIENCE

Going Against the Flow

Photographer tries not to get swept away

Like a giant, spindly, three-legged insect, the tripod towered over the sandy seafloor—and almost skittered away. Photographer **Brian Skerry** had spent most of one day in warm waters off the Florida Keys assembling the 23-foot-tall contraption he and Society photo engineer Joe Stancampiano had developed back at headquarters. The plan was to mount a camera on the tripod for shots of the Aquarius research station's exterior. The reality: "The current was so strong that the legs never stopped vibrating," Brian recalls. A tripod with the shakes isn't much good for holding a camera, but Brian found a way. "I ended up using it as a perch. I wrapped a leg around it and got the angle I wanted."



GNMENT

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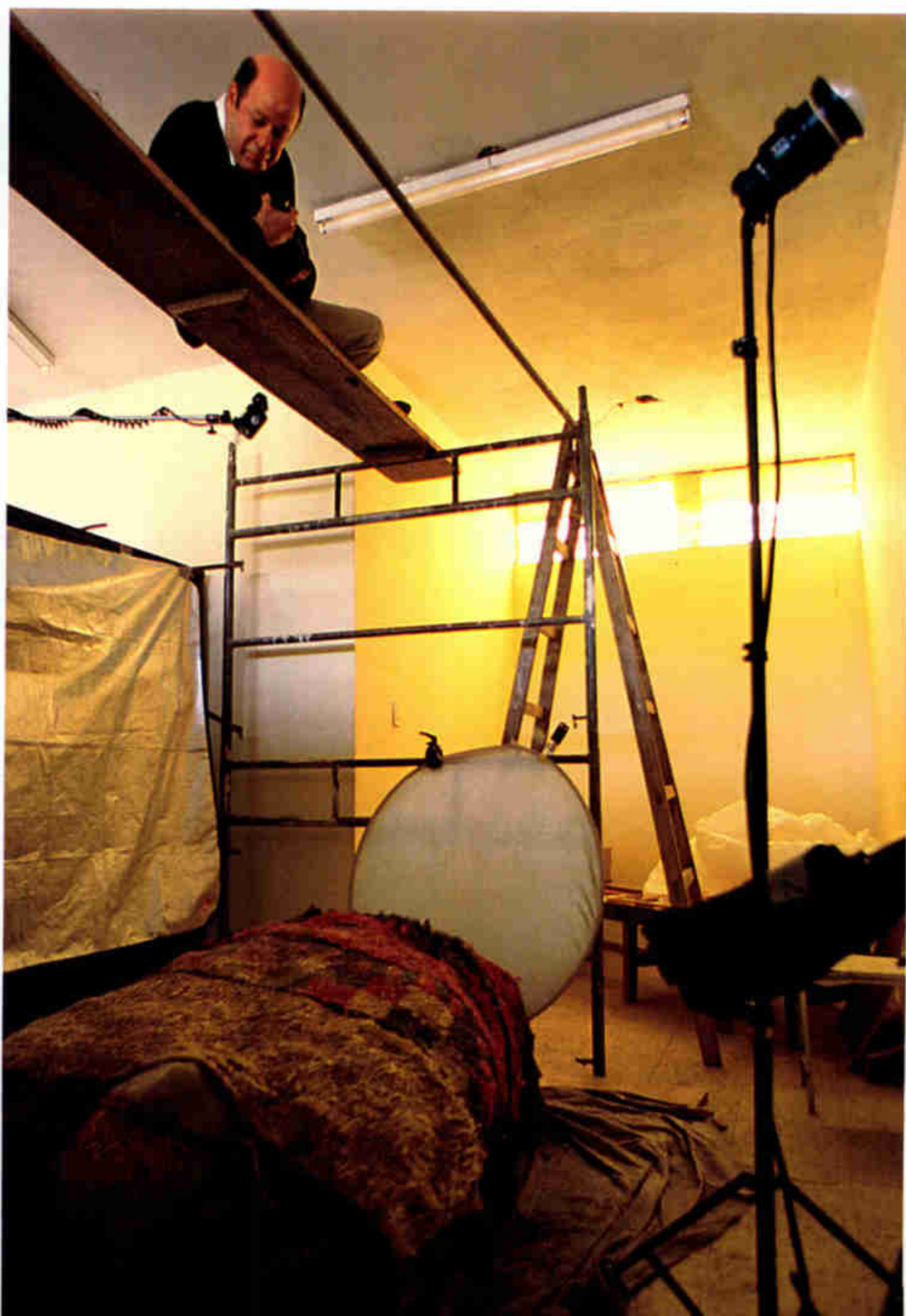
WINGED MUMMY OF PERU

Working the Room

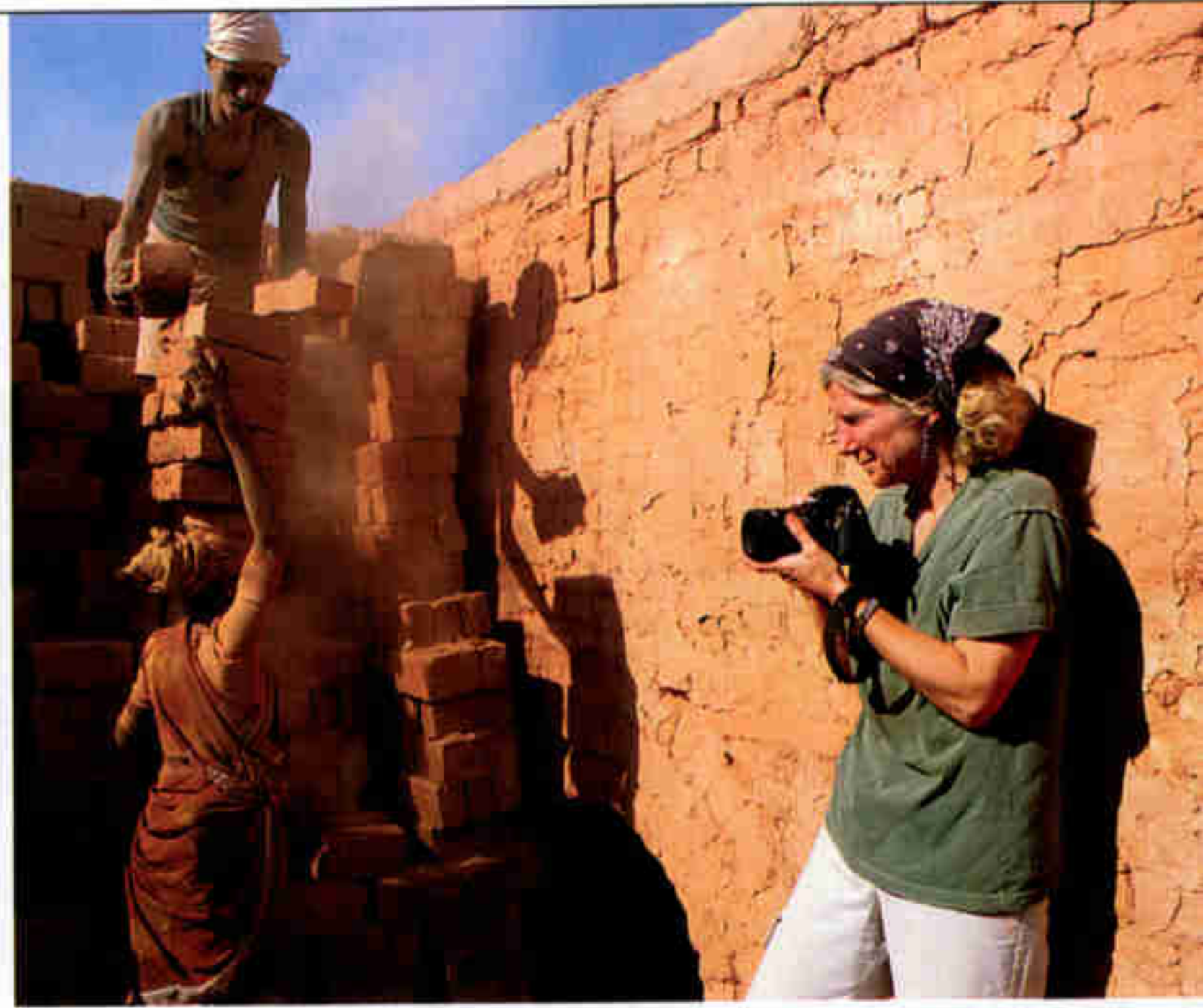
Sometimes it's hard to get a view from the top

In a small room in a small museum in the small town of Ica, Peru, **Ira Block** had a big problem. He had been assigned to photograph a 1,300-year-old mummy bundle. But the bundle weighed some 200 pounds and wasn't easily moved. Ira figured he could position himself above the object to shoot it, and planned to buy two ladders and a board to lay across them to

make a platform. Next problem: There were no ladders for sale in Ica. "People build their own ladders there," he says. "I thought, two homemade ladders with me lying on a board between them? And if I fall, I destroy a rare ancient mummy?" Luckily a local man was soon found to install some sturdy scaffolding. Ira (below) appreciated the support.



MARK CONLIN (ABOVE); MARIO VILDÓSOLA B.



NGS PHOTOGRAPHER JODI COBB (LEFT), WITH NEHA DIDDEE (RIGHT)

21ST-CENTURY SLAVES

On Misery's Trail

The toll of reporting on human anguish

Fruit pickers come to the U.S. from Central America in search of a living. But, as writer **Andrew Cockburn** reports, they often find something much worse. In Florida, at a meeting of an immigrant labor group called the Coalition of Immokalee Workers, Andrew (above, holding his notes) spoke

with pickers who had escaped slavery. He felt heartened by the coalition's efforts to free other slaves, but such moments of hope seemed rare. "This is the most depressing article I've ever worked on," he says.

"Hell on Earth," is how the story's photographer, **Jodi Cobb** (above right), describes the

brickworks in Sadanandapur, India. The temperature was 115°F outside the kiln, and hotter within, where workers stoked fires to bake stacks of mud bricks. "The wind blew dust into our faces—it was absolute misery. I suffered for a few hours; these people suffer their whole lives."

It was Jodi who suggested that NATIONAL GEOGRAPHIC do an article on modern slavery. "I became obsessed with publishing this story because without an awareness the problem will just get worse."

WORLDWIDE

The collages in this month's ZipUSA story were built—literally—from the ground up. Photographer **Maria Stenzel** (below, in the white shirt) and picture editor **Susan Welchman** (wearing black) put the

story's photographs together like puzzle pieces on Susan's office floor at headquarters in Washington, D.C. Their inspiration came from artist David Hockney's photo collages. "They give your eye an opportunity to flit around," says Maria. "I've always wanted to try it."



REBECCA HALE, NGS STAFF

Anup and Manoj Shah grew up in Kenya taking pictures of wildlife at Nairobi National Park, but eventually the brothers abandoned their cameras for academia in England.

"You have to earn a living," says Anup. "I've got a doctorate in economics. Manoj has a master's in aerial surveying [photogrammetry]." These days the self-taught photographers happily squander their educations back in Africa, doing what they loved as boys: photographing animals. For their zebra story, the brothers followed the striped migrants by car. "We shared the driving," says Anup. "But in camp Manoj had to do all the cooking. I'm hopeless."

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Find more stories from our authors and photographers, including their best, worst, and quirkiest experiences, at nationalgeographic.com/ngm/0309.

TO ENSURE SOCIAL SECURITY SOLVENCY:



Fig. 1

Find a telephone.



Fig. 2

Call the President of the United States and have him "handle that."



Fig. 3

Hang up.

2b

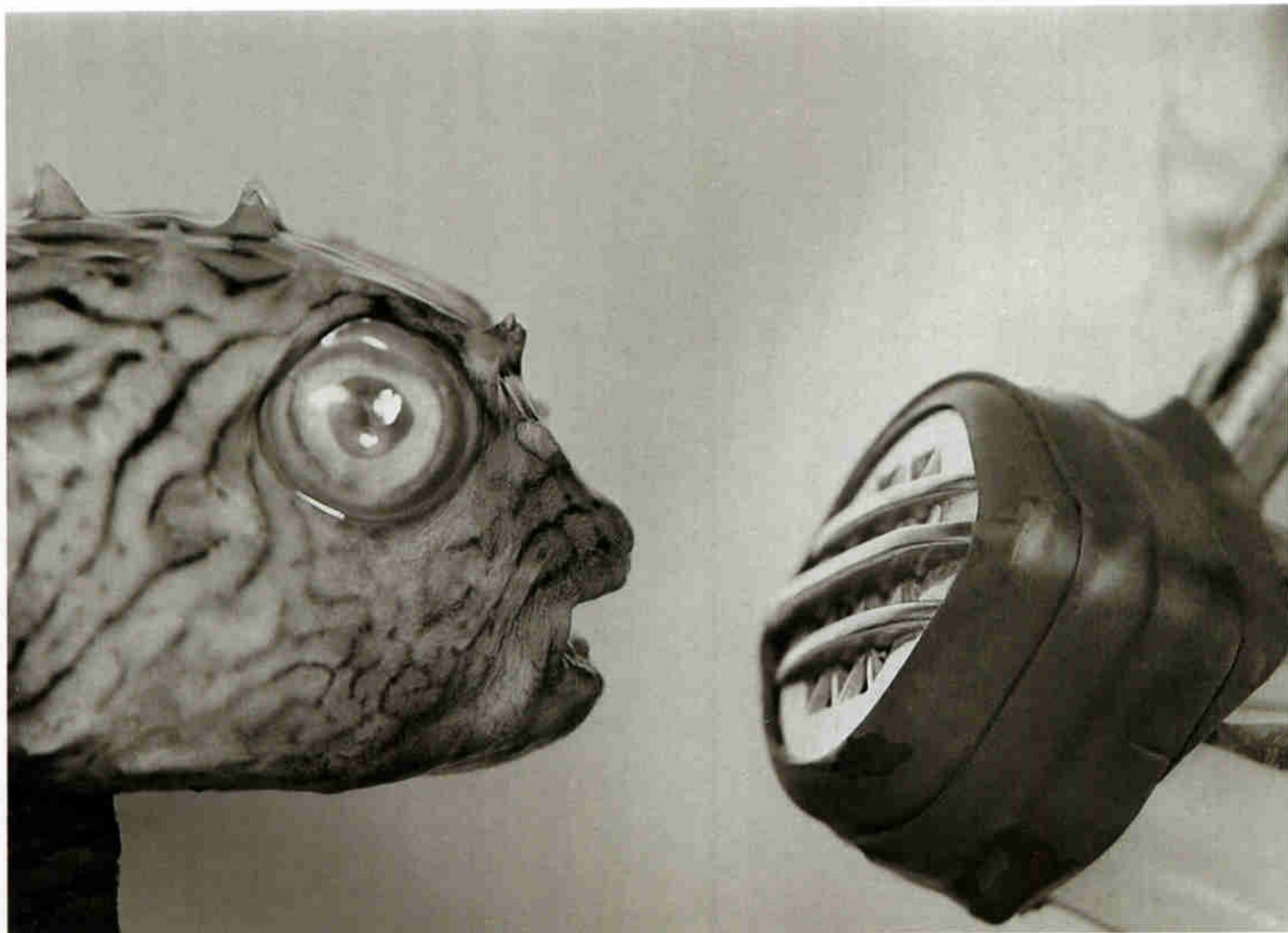
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FROM OUR ARCHIVES

Flashback



HULTON ARCHIVE, GETTY IMAGES

DEEP SCIENCE

Sounds Fishy

"You don't think of fish as making noises, but many do. They grunt, purr, drum, croak, and grind their teeth!" wrote F. Barrows Colton in the January 1945 *GEOGRAPHIC*, where this photo first appeared. As part of an experiment to record fish noises at a New York aquarium, photographer Lilo Hess used a pinch of fish food to lure this striped burrfish to the microphone. Despite its resemblance to a big band crooner, however, the bug-eyed burrfish doesn't vocalize through its lips but by grinding its teeth to display distress or aggression—or attract mates.

At about the same time, the U.S. Navy was also collecting recordings of undersea sounds. It needed them to teach sailors listening to submarine-detection devices how to tell the difference between fish noises and enemy propellers.

WEBSITE EXCLUSIVE

You can send this month's Flashback as an electronic greeting card and access the Flashback photo archives at nationalgeographic.com/ngm/flashback/0309.

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A man is driving a Ford Expedition, and a woman is in the passenger seat. They are both looking at a navigation screen in the center console. The car is moving through a landscape with trees and a sunset sky, with motion blur visible through the windows. The interior of the car is visible, including the steering wheel with the Ford logo and the dashboard.

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